2.1.1. V3

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
OREGON OPERATIONS OFFICE
805 SW Broadway, Suite 500
Portland, Oregon 97205

January 18, 2008

Mr. Jim McKenna
Port of Portland & Co-Chairman, Lower Willamette Group
121 NW Everett
Portland, Oregon 97209

Mr. Robert Wyatt
Northwest Natural & Co-Chairman, Lower Willamette Group
220 Northwest Second Avenue
Portland, Oregon 97209

Re: Portland Harbor Superfund Site; Administrative Order on Consent for Remedial Investigation and Feasibility Study; Docket No. CERCLA-10-2001-0240. Comprehensive Round 2 Site Characterization and Data Gaps Analysis Report – Screening Level Ecological Risk Assessment

Dear Messrs. Wyatt and McKenna:

On January 15, 2008, EPA submitted comments on the Comprehensive Round 2 Site Characterization and Data Gaps Report (Round 2 Report). As stated in our comments, EPA is planning on delivering additional comments on specific elements of the Round 2 Report. The attached document serves as EPA comments on the screening level ecological risk assessment (SLERA). The SLERA was presented in various attachments to Appendix G of the Round 2 Report. In general, the SLERA presented in the Round 2 Report was consistent with EPA guidance, recommendations and direction. The only significant exception was the elimination of sediment quality guidelines from the screening step.

EPA's review of the SLERA focuses on the following elements:

1. Comparison of surface and subsurface sediment chemistry values to sediment quality guidelines (SQGs) from the literature.

2. Evaluation of each component of the SLERA in the Round 2 Report.

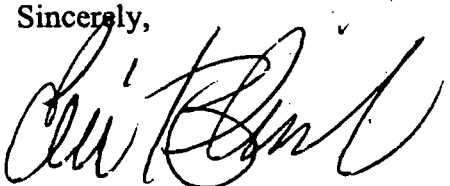
3. The calculation of hazard quotients based on maximum concentrations presented the Round 2 Report.

4. Compilation of a Screening-Level COPC list from tasks 1 and 2, and comparison against the ecological COPC list for each receptor group presented in the Round 2 Report.

As indicated in our January 15, 2008 comments on the Round 2 Report, EPA is developing a draft Problem Formulation for the Ecological Risk Assessment. This will serve as the basis for a final problem formulation to be developed by the LWG and a mechanism for reaching agreement how to perform the baseline ecological risk assessment (BERA). The attached SLERA provides an updated summary of chemicals of potential ecological concern (COPCs) that screened in based on all data collected up through preparation of the Round 2 Report. These COPCs should be carried forward into the BERA. However, EPA recognizes that this screening-level COPC list may need to be updated based on the incorporation of the Round 3B data and the problem formulation for the BERA. In addition, the forthcoming EPA problem formulation will include approaches for performing a refined screen as part of the BERA to ensure that the appropriate COPCs are carried forward into the BERA.

EPA recommends discussing the our comments on the SLERA once you have received our draft Problem Formulation for the Ecological Risk Assessment. If you have any questions, please contact Chip Humphrey at (503) 326-2678 or Eric Blischke (503) 326-4006. All legal inquiries should be directed to Lori Cora at (206) 553-1115.

Sincerely,



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Updated Screening-level Ecological Risk Assessment for the Portland Harbor Site

Introduction

As part of its review of the *Portland Harbor RI/FS Comprehensive Round 2 Site Characterization Summary And Data Gaps Analysis Report* (Lower Willamette Group, February 21, 2007, hereafter referred to as the Round 2 Report or R2R), EPA has reviewed the screening-level ecological risk assessment (SLERA) presented in the Round 2 Report. Our review focused on accuracy, compliance with EPA guidance, recommendations and direction, completeness of the screens presented in the Round 2 Report, the incorporation of a sediment quality guideline (SQG) screen, and the calculation of hazard quotients (HQs) based on the maximum concentration detected and the appropriate screening level value (SLV).

An initial screening level assessment was presented in the 2006 Preliminary Risk Evaluation (PRE). In addition, a screening level assessment was presented on a receptor group basis in the Round 2 Report. However, EPA feels that preparation of a standalone SLERA report is needed to provide clarity, transparency, and ease of understanding of the screens performed during the initial stages of the ecological risk assessment, and to more clearly define the rationale for the chemicals and exposure pathways carried forward to the baseline ecological risk assessment (BERA). This report will thus also provide a useful summary of the available data collected in support of the ecological risk assessment during the remedial investigation of Portland Harbor and reviewed and evaluated by EPA.

The SLERA update in this document has been developed following the guidance in *Ecological Risk Assessment Guidance for Superfund: Process for Designing and Conducting Ecological Risk Assessments – Interim Final* (EPA 1997), which outlines an eight-step process for performing ecological risk assessments. This SLERA document comprises the outputs of Steps 1 (Screening-Level Problem Formulation and Ecological Effects Evaluation) and 2 (Screening-Level Exposure Estimate and Risk Calculation) of the eight-step process.

General Approach

The updated SLERA developed by EPA in this document focuses on four primary evaluations:

1. Comparison of surface and subsurface sediment chemistry values to sediment quality guidelines (SQGs) from the literature.

2. Evaluation of each component of the SLERA in the Round 2 Report.

3. The calculation of hazard quotients based on maximum concentrations presented the Round 2 Report.

4. Compilation of a Screening-Level COPC list from tasks 1 and 2, and comparison against the ecological COPC list for each receptor group presented in the Round 2 Report.

The methodologies used and results observed for each of these evaluations are described in the following sections.

SLERA Problem Formulation

Much of the background information required for Step 1 of the ecological risk assessment (ERA) process has been presented and summarized in previous Portland Harbor documents, such as the PRE and Appendix B (Ecological Risk Assessment Approach) of the *Portland Harbor RI/FS Programmatic Work Plan* (Lower Willamette Group, April 23, 2004), including:

- Environmental setting and contaminants known or suspected to exist at the site
- Contaminant fate and transport mechanisms
- Ecotoxicity mechanisms associated with site contaminants and categories of ecological receptors that could be affected
- Identification of complete exposure pathways
- Selection of endpoints to screen for ecological risk

In addition, detailed information on the Portland Harbor site is presented in the Round 2 Report. As a result, a detailed description of the geographic scope of the study area is not included here. It should be noted, however, that the area from which environmental data has been collected now extends from approximately river mile (RM) 1 to RM 12 and the upper reaches of Multnomah Channel.

Assessment and Measurement Endpoints for the SLERA

As per EPA (1997), the assessment endpoint for a population is any adverse effect on an ecological receptor, where adverse effects are inferred from measures related to impaired survival, reproduction or growth. In generic terms, the screening-level assessment endpoints take the form of:

Survival, reproduction or growth of (***ecological receptor***)

where the ecological receptors are broad categories such as:

- Fish
- Zooplankton
- Aquatic-dependent birds
- Aquatic-dependent mammals
- Amphibians
- Aquatic plants
- Benthic invertebrates

The only screening-level measurement endpoint for each ecological receptor group in this SLERA is:

- Comparison of the maximum detected chemical concentration (or dose) in each medium or tissue type to a conservative, no effect concentration screening-level benchmark.

By using maximum concentrations in the environmental media (water, sediment or tissue) and the lowest possible screening benchmarks, the SLERA is designed to minimize chances of eliminating a chemical of potential ecological concern (COPC) from further consideration when it may pose an actual ecological risk. Thus, the resulting SLERA risk estimate is expected to be an overstatement of actual risk and generally is not used to derive remedial action cleanup levels (EPA 1997).

From the available data, potential ecological risks will be estimated based upon a series of calculated hazard quotients (HQs). In short, an HQ is calculated by dividing the estimated exposure dose or estimated environmental concentration (EEC, defined as the maximum detected concentration, for purposes of the SLERA) by a toxicity benchmark or screening-level benchmark for each receptor.

$$HQ = \frac{\text{Dose}}{\text{Toxicity benchmark}} \quad or \quad \frac{\text{Maximum detected concentration}}{\text{Screening level benchmark}}$$

If the HQ is ≥ 1.0, the exposure pathway will be further evaluated in a baseline ecological risk assessment (BERA). If the HQ is < 1.0, this indicates that harmful effects are not likely and the exposure pathway can be eliminated from BERA investigations, unless new data collected in Round 3 suggest otherwise or the screening process would be expected to change based on the problem formulation for the ecological risk assessment. No other screens are performed in this SLERA.

Sediment Screen Using SQGs

Sediment chemistry data provided in the Query Manager (QM) database (version 2.6, Portland Harbor Cat1Risk, October 2007 data update) were screened against the lowest values from a selected set of Sediment Quality Guidelines (SQGs). The results of this screen were then compared to those presented for the ERA in the Round 2 Report. QM's surface and subsurface datasets were screened separately against the minimum SQGs.

Selection of Minimum SQGs

All freshwater consensus threshold effect concentration (TEC), freshwater threshold effect level (TEL), Washington State Sediment Quality Standard (SQS), and Washington State Cleanup Screening Level (CSL) values were extracted from QM. Any chemical with at least one of these SQGs available in the QM database (FWCONTEC, TELFW, WA_SQS, QA_CSL from sqc.dbf) was included in an initial list of chemicals for screening. For these chemicals, the minimum of the available SQGs was identified for use in screening. If none of these SQGs were available for a given chemical, SQGs were selected from the Joint Source Control Strategy (JSCS) (Table 3-1, 07/16/07 revision, MacDonald PEC [or other SQV] column). For some chemicals, the JSCS value was lower than the minimum SQG calculated from the other sources; however, the JSCS values were not used in these cases. Table 1 lists the SQGs identified for use in the screening of the QM sediment database.

While chemical concentrations reported on a dry-weight basis were compared to the TEC and TEL SQGs, concentrations of select organic chemicals had to be normalized for total organic carbon (TOC) prior to comparison to the SQS and CSL SQGs. For a chemical concentration, TOC normalization may result an exceedance of the SQS or CSL, even thought the dry-weight concentration does not exceed the minimum SQG as computed above. To account for this possibility, TOC-normalized concentrations of those chemicals with SQS and CSL values were also screened against the SQS value (the lower of two SQG values).

TABLE 1. MINIMUM SQGS USED FOR SEDIMENT SCREENING

QM CHEMCLASS	QM CHEMCODE	QM CHEMNAME	UNITS	SQGs from QM				Minimum SQG[2]	JSCS
				TEC	TEL	CSL[1]	SQS[1]		
METALS	ANTIMONY	Antimony	PPM						64
METALS	ARSENIC	Arsenic	PPM	9.79	5.9	93	57	5.9	33
METALS	CADMIUM	Cadmium	PPM	0.99	0.596	6.7	5.1	0.596	4.98
METALS	CHROMIUM	Chromium, total	PPM	43.4	37.3	270	260	37.3	111
METALS	COPPER	Copper	PPM	31.6	35.7	390	390	31.6	149
METALS	LEAD	Lead	PPM	35.8	35	530	450	35	128
METALS	MANGANESE	Manganese	PPM						1100
METALS	MERCURY	Mercury	PPM	0.18	0.174	0.59	0.41	0.174	1.06
METALS	NICKEL	Nickel	PPM	22.7	18			18	48.6
METALS	SELENIUM	Selenium	PPM						5
METALS	SILVER	Silver	PPM			6.1	6.1	6.1	5
METALS	ZINC	Zinc	PPM	121	123.1	960	410	121	459
PAH	METHNAP_2	2-Methylnaphthalene	PPB			64000	38000	38000	200
PAH	ACENAPTHEN	Acenaphthene	PPB			57000	16000	16000	300
PAH	ACENAPTYLE	Acenaphthylene	PPB			66000	66000	66000	200
PAH	ANTHRACENE	Anthracene	PPB	57.2		1200000	220000	57.2	845
PAH	BAA	Benzo(a)anthracene	PPB	108	31.7	270000	110000	31.7	1050
PAH	BAP	Benzo(a)pyrene	PPB	150	31.9	210000	99000	31.9	1450
PAH	BGHIP	Benzo(g,h,i)perylene	PPB			78000	31000	31000	300
PAH	BKF	Benzo(k)fluoranthene	PPB						13000
PAH	TBFLANTH	Benzofluoranthenes, total	PPB			450000	230000	230000	
PAH	CHRYSENE	Chrysene	PPB	166	57.1	460000	110000	57.1	1290
PAH	BANTH2	Dibenzo(a,h)anthracene	PPB	33		33000	12000	33	1300
PAH	DIBNZFURAN	Dibenzofuran	PPB			58000	15000	15000	
PAH	FLUORANTHN	Fluoranthene	PPB	423	111.3	1200000	160000	111.3	2230
PAH	FLUORENE	Fluorene	PPB	77.4		79000	23000	77.4	536
PAH	ICDP	Indeno(1,2,3-c,d)pyrene	PPB			88000	34000	34000	100
PAH	NAPTHALENE	Naphthalene	PPB	176		170000	99000	176	561

TABLE 1. MINIMUM SQGS USED FOR SEDIMENT SCREENING

QM CHEMCLASS	QM CHEMCODE	QM CHEMNAME	UNITS	SQGs from QM				Minimum SQG[2]	JSCS
				TEC	TEL	CSL[1]	SQS[1]		
PAH	TOTAL_PAH	PAHs, total	PPB	1610				1610	
PAH	HPAH	PAHs, total high molecular weight PAHs	PPB			5300000	960000	960000	
PAH	LPAH	PAHs, total low molecular weight PAHs	PPB			780000	370000	370000	
PAH	PHENANTHRN	Phenanthrene	PPB	204	41.9	480000	100000	41.9	1170
PAH	PYRENE	Pyrene	PPB	195	53	1400000	1000000	53	1520
PEST-PCB	ALDRIN	Aldrin	PPB						40
PEST-PCB	AR_1016	Aroclor 1016	PPB						530
PEST-PCB	AR_1248	Aroclor 1248	PPB						1500
PEST-PCB	AR_1254	Aroclor 1254	PPB						300
PEST-PCB	AR_1260	Aroclor 1260	PPB						200
PEST-PCB	CHLORDANE	Chlordane (cis & trans)	PPB	3.24	4.5			3.24	17.6
PEST-PCB	DDD_SUM	DDTs, sum of p,p'-DDD and o,p'-DDD	PPB	4.88				4.88	28
PEST-PCB	DDE_SUM	DDTs, sum of p,p'-DDE and o,p'-DDE	PPB	3.16				3.16	31.3
PEST-PCB	DDT_SUM	DDTs, sum of p,p'-DDT and o,p'-DDT	PPB	4.16				4.16	62.9
PEST-PCB	DDT_TOTAL	DDTs, total of 6 isomers	PPB	5.28	7			5.28	
PEST-PCB	DIELDRIN	Dieldrin	PPB	1.9	2.85			1.9	61.8
PEST-PCB	ENDRIN	Endrin	PPB	2.22	2.67			2.22	207
PEST-PCB	HEPTACHLOR	Heptachlor	PPB						10
PEST-PCB	HEPCL_EPOX	Heptachlor epoxide	PPB	2.47	0.6			0.6	16
PEST-PCB	CLBNZ6	Hexachlorobenzene	PPB			2300	380	380	100
PEST-PCB	CL_CHX_G6	Hexachlorocyclohexane-gamma	PPB	2.37	0.94			0.94	4.99
PEST-PCB	CLCYPEN6	Hexachlorocyclopentadiene	PPB						400
PEST-PCB	PP_DDD	p,p'-DDD	PPB		3.54			3.54	
PEST-PCB	PP_DDE	p,p'-DDE	PPB		1.42			1.42	
PEST-PCB	PCB_SUM	PCBs, total (calc)	PPB	59.8	34.1	65000	12000	34.1	676
SVOL	CLBNZ124_3	1,2,4-Trichlorobenzene	PPB			1800	810	810	9200
SVOL	CLBNZ12_2	1,2-Dichlorobenzene	PPB			2300	2300	2300	1700
SVOL	CLBNZ13_2	1,3-Dichlorobenzene	PPB						300

TABLE 1. MINIMUM SQGS USED FOR SEDIMENT SCREENING

QM CHEMCLASS	QM CHEMCODE	QM CHEMNAME	UNITS	SQGs from QM				Minimum SQG[2]	JSCS
				TEC	TEL	CSL[1]	SQS[1]		
SVOL	CLBNZ14_2	1,4-Dichlorobenzene	PPB			9000	3100	3100	300
SVOL	MPHN24_2	2,4-Dimethylphenol	PPB			29	29	29	
SVOL	METPHNOL_2	2-Methylphenol	PPB			63	63	63	
SVOL	METPHNOL_4	4-Methylphenol	PPB			670	670	670	
SVOL	BENZOIC_AC	Benzoic acid	PPB			650	650	650	
SVOL	BENZYL_OH	Benzyl alcohol	PPB			73	57	57	
SVOL	B2ETHXPHTH	Bis(2-ethylhexyl)phthalate	PPB			78000	47000	47000	800
SVOL	BUTBNZ_PHT	Butylbenzyl phthalate	PPB			64000	4900	4900	
SVOL	CARBAZOLE	Carbazole	PPB						1600
SVOL	DEP	Diethyl phthalate	PPB			110000	61000	61000	600
SVOL	DMP	Dimethyl phthalate	PPB			53000	53000	53000	
SVOL	DINBP	Di-n-butyl phthalate	PPB			1700000	220000	220000	100
SVOL	NOCTP2	Di-N-octyl phthalate	PPB			4500000	58000	58000	
SVOL	CLBUTAD6	Hexachlorobutadiene	PPB			6200	3900	3900	600
SVOL	NNP	N-nitrosodiphenylamine	PPB			11000	11000	11000	
SVOL	CLPHN5	Pentachlorophenol	PPB			690	360	360	1000
SVOL	PHENOL	Phenol	PPB			1200	420	420	50
VOL	CLETHENE4	Tetrachloroethene	PPB						500
VOL	CLETHENE3	Trichloroethene	PPB						2100
DIOXFURN	PCD2378	2,3,7,8-TCDD (Dioxin)	PPB*						0.009

[1] The WA SQS and CSL values are not based on TOC-normalized concentrations for metals, as well as phenol, 2-methylphenol, 4-methylphenol, 2,4,-dimethylphenol, pentachlorophenol, benzyl alcohol, and benzoic acid.

[2] Minimum SQG is based on TEC, TEL, WA CSL, and WA SQS values without any adjustment for TOC.

TEC: Consensus-Based Freshwater Threshold Effect Concentrations (MacDonald, D.D., C.G. Ingersoll, T.A. Berger 2000) (FWCONTEC in QM).

TEL: Threshold Effect Level, freshwater (Smith, S.S., D.D. MacDonald, K.A. Keenleyside, C.G. Ingersoll, and L.J. Field 1996) (TELFW in QM).

CSL: Washington State Cleanup Screening Levels and Minimum Cleanup Levels (Washington State Department of Ecology 1995) (WA_CSL95 in QM).

SQS: Washington State Sediment Quality Standards (Washington State Department of Ecology 1995) (WA_SQS95 in QM).

JSCS: Joint Source Control Strategy, Table 3-1 (07/16/07 Revision). These values were only used when there were no values available for the other SQGs.

Study and Station Review

Before completing the screening of sediment data against SQGs, sampling station locations from all studies with Cat1Risk sediment chemistry data contained in the QM database (both surface and subsurface) were reviewed to identify any sampling stations outside the study area as defined in the Round 2 Report or any in areas where dredging occurred after samples were collected. The goal of this evaluation was to ensure that the screening step was performed against relevant site data. Stations were reviewed based on the latitudes and longitudes stored in QM against the study area as defined in the Round 2 Report (RM 2 to RM 11; but for "purposes of the ERA dataset, samples collected between RM 1.91 and RM 11 were considered part of the Study Area" – Round 2 Report, Appendix G, Section 2.1.1, page 5). A shapefile of dredge areas was available from the February 2007 Data Review Retreat GIS data library. This data layer shows areas of dredging from 1980 to 2001 (C:\gis\projects\PortlandHarbor2\Base\Sediment_Physical\dredge.shp). Samples associated with stations outside the study area or within areas dredged after sample collection were excluded from screening. For those stations excluded due to dredging, samples at all depths were excluded, since the depth of dredging was not known. Additionally, samples associated with stations having no latitude or longitude stored in QM were also excluded from the screening.

Table 2 summarizes results of the study and station review. Of the studies included in QM, three have all surface sediment sampling stations located outside the study area. Surface sediment data from these studies were not considered further in the screening process:

- Ross Island Phase 1 (Landau) (QM STUDYID = 42), 6 surface stations
- TOSCO 1999 Sediment Sampling Results (QM STUDYID = 23), 1 surface station
- Willamette O&M Sediment Characterization (QM STUDYID = 94), 2 surface stations

However, subsurface stations from the last two projects listed are located within the study area, and sediment chemistry data collected from these stations were included in the subsurface SQG screening.

Another study included in the QM Cat1Risk database has all its stations located within an area that was dredged the same year as sampling occurred. Chemistry data from the two surface stations and one subsurface station sampled for the T2 Berth 2003 Project (QM STUDYID = 71) were excluded from the SQG screening process.

For the Round 2 Report ERA (Table 2-2 in Appendix G), data were included from the studies listed in Table 2 of this SLERA, with the following exceptions (in addition to those listed above):

- Pilot Study 2005 (QM STUDYID = A2)
- Round 3 2006 – Upstream/downstream sediment (QM STUDYID = Ac)

Note that the Round 3 2006 upstream/downstream study was conducted after the cut-off date set for new data to be included in the ERA dataset.

Four of the studies screened have only subsurface sediment chemistry data stored in QM:

- McCormick & Baxter September 2002 Sampli (QM STUDYID = 81)
- ATOFINA Phase2 Stage1/2 In-River Investi (QM STUDYID = 86)
- US Moorings Sed Invest 2002 (QM STUDYID = 96)
- Gasco EE/CA (QM STUDYID = E0)

Note that the ERA dataset included the US Moorings 2002 study (QM STUDYID = 96) as a source for surface sediment data (Appendix G, Table 2-2). The chemistry data stored in the QM database for this study are stored in the subsurface dataset, since sample lower depths are deeper than 30.5 cm.

Several additional stations were specifically excluded from the ERA dataset used in the Round 2 Report (RiskDataChangeLog_20070216.txt, provided with the ERA database as part of the Round 2 Report deliverable). The station IDs corresponding to sample IDs listed in RiskDataChangeLog_20070216.txt were identified in QM using the EXSAMPID field provided with sample information:

1. Sample ID LW2-C494-A (QM STATIONID C494) was dredged.
2. Sample IDs WLCMBJ99D09910 WLCMBJ99D09922 (QM STATIONIDs 35010, 35022) were dredged or capped.
3. Sample IDS WLCT4C04PS33331113, WLCT4C04PS33C33911, WLCT4C04PS33VC3357 (QM STATIONID 98086) were dredged or capped.
4. Sample IDs WLCT4C04STS1, WLCT4C04STS3E, WLCT4C04STS3W, WLCT4C04STTD, WLCT4C04ST416 (QM STATIONIDs 98015, 98016, 98017, 98018, 98019) were collected by sediment trap.

Stations excluded from SQG screening are listed in Tables 3 (surface) and 4 (subsurface).

The Round 2 Report also states that "Sediment natural attenuation cores collected by LWG for nature and extent were not included in the ERA dataset because multiple depth intervals in small increments (as small as 4 cm) were collected within the 0 to 30.5 cm surface sediment depth horizon, and these cores were collected to support the nature and extent evaluation." It was not clear which study this statement was referring to. Consequently, surface and subsurface data associated with all remaining studies and stations were used for the SQG screenings.

TABLE 2. STUDIES INCLUDED IN QM'S CAT1RISK DATABASE FOR PORTLAND HARBOR

QM Study ID	QM Study Name	Last Year Samples Collected	Number of Surface Stations (in QM / inside study area)[1]	Number of Subsurface Stations (in QM / inside study area)[1]	Notes
17	Portland Shipyard Env. Audit	1998	8 / 8	2 / 2	
20	Portland Shipyard Sed. Inv.	1998	57 / 54	17 / 17	
23	TOSCO 1999 Sediment Sampling Results	1999	1 / 0	2 / 2	Surface stations outside study area and excluded from screening.
33	Gasco Source Control Evaluation	2001	9 / 9	9 / 9	
35	McCormick & Baxter RI Phase 3	1999	43 / 39	N/A[2]	
42	Ross Island Phase 1 (Landau)	1999	6 / 0	15 / 0	Stations outside study area and excluded from screening.
71	T2 Berth 203 Project	1994	2 / 2	1 / 1	Stations within an area dredged in 1994 and excluded from screening.
74	Willamette River 1998 Data	1998	12 / 12	N/A	
76	Portland Harbor Sediment Investigation	1997	150 / 150	37 / 37	
78	City Outfall Pilot Project	2002	18 / 18	N/A	
81	McCormick & Baxter September 2002 Sampli	2002	N/A	10 / 10	
86	ATOFINA Phase2 Stage1/2 In-River Investi	2003	N/A	21 / 21	
87	PAH in surface sediments	1997	33 / 33	N/A	
93	City Outfall Sediment Investigation	2002	86 / 86	N/A	
94	Willamette O&M Sediment Characterization	2004	2 / 0	19 / 19	Surface stations outside study area and excluded from screening.
96	US Moorings Sed Invest 2002	2002	N/A	3 / 3	
98	Terminal 4 EECA	2004	49/ 49	45 / 45	
99	2005 O&M Dredge Sediment Characterizatio	2005	82 / 73	72 / 66	
A0	Round 1 2002 – Portland Harbor (PH)	2002	58 / 58	N/A	
A1	Round 2A 2004 – Portland Harbor	2004	614 / 596	217 / 217	
A2	Pilot Study 2005	2005	9 / 9	N/A	
A5	Round 2A 2005 – PH Benthic Study	2005	35 / 35	N/A	
A6	Round 2B 2005 – PH Cores	2005	35 / 35	45 / 45	
A7	Round 2A 2005 – PH GW Pathway	2005	38 / 38	N/A	
Ab	Round 2A 2004 – PH Beach sediments	2004	27 / 27	N/A	
Ac	Round 3 2006 – Up/downstream sediment	2007	32 / 6	20 / 5	
E0	Gasco EE/CA	2004	N/A	15 / 15	

[1] Determination of inside/outside study area or dredge area was based on coordinates provided in QM for each station.

[2] N/A = Not applicable. No surface/subsurface sampling occurred for these studies and/or no surface/subsurface sample data are included in QM.

TABLE 3. STATIONS EXCLUDED FROM SURFACE SQG SCREENING

QM Station ID	QM Study ID	QM Study Name	Reason for Exclusion
20076	20	Portland Shipyard Sed. Inv.	Outside Study Area
20077	20	Portland Shipyard Sed. Inv.	Outside Study Area
20078	20	Portland Shipyard Sed. Inv.	Outside Study Area
35010	35	McCormick & Baxter RI Phase 3	Dredged
35022	35	McCormick & Baxter RI Phase 3	Dredged
35040	35	McCormick & Baxter RI Phase 3	Outside Study Area
35041	35	McCormick & Baxter RI Phase 3	Outside Study Area
35042	35	McCormick & Baxter RI Phase 3	Outside Study Area
35043	35	McCormick & Baxter RI Phase 3	Outside Study Area
71001	71	T2 Berth 203 Project	Dredged
71002	71	T2 Berth 203 Project	Dredged
98015	98	Terminal 4 EECA	Sediment Trap
98016	98	Terminal 4 EECA	Sediment Trap
98017	98	Terminal 4 EECA	Sediment Trap
98018	98	Terminal 4 EECA	Sediment Trap
98019	98	Terminal 4 EECA	Sediment Trap
98086	98	Terminal 4 EECA	Dredged
99074	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99075	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99076	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99077	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99078	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99079	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99080	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99081	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99082REF	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
C494	A1	Round 2A 2004 - Portland Harbor	Dredged
DG03	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG04	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG05	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG06	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area

TABLE 3. STATIONS EXCLUDED FROM SURFACE SQG SCREENING

QM Station ID	QM Study ID	QM Study Name	Reason for Exclusion
DG07	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG08	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG09	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG10	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG11-1	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG11-2	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG12	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG14	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG15	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG16	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG17	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG18	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DG19	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
U1C-1	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U1C-2	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U1C-3	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U2C-1	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U2C-2	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U2C-3	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U3C-1	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U3C-2	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U3C-3	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U4Q-1	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U4Q-2	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U4Q-3	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U5Q-1	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U5Q-2	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U5Q-3	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U6TOC-1	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U6TOC-2	Al	Round 2A 2004 - Portland Harbor	Outside Study Area
U6TOC-3	Al	Round 2A 2004 - Portland Harbor	Outside Study Area

TABLE 3. STATIONS EXCLUDED FROM SURFACE SQG SCREENING

QM Station ID	*QM Study ID*	*QM Study Name*	Reason for Exclusion
UG01	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG02	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG03	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG04-1	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG04-2	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG05	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG06	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG07	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UG08	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area

TABLE 4. STATIONS EXCLUDED FROM SUBSURFACE SQG SCREENING

QM Station ID	QM Study ID	QM Study Name	Reason for Exclusion
71001	71	T2 Berth 203 Project	Dredged
98086	98	Terminal 4 EECA	Dredged
99149	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99150	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99151	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99152	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99153	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
99154	99	2005 O&M Dredge Sediment Characterization	Outside Study Area
C494	A1	Round 2A 2004 - Portland Harbor	Dredged
DC02	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DC03	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DC04	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DC05	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DC06	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
DC07	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC01	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC02	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC03	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC04	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC05-1	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC05-2	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC06	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC07	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area
UC08	Ac	Round 3 2006 - Up/downstream sediment	Outside Study Area

Surface Data Screening

According to the Round 2 Report, all surface sediment data included in the ERA dataset were collected from within the top 30.5 cm of the sediment horizon. This corresponds to QM's definition of surface sediment data (UDEPTH = 0 cm and LDEPTH < 30.5 cm). Consequently, QM's Portland Harbor Cat1Risk surface dataset (as provided in chem.DBF) was used to perform the surface SQG screening. To provide a trackable and repeatable process, Microsoft® Access was used to perform the screening process, rather than performing over 70 QM queries and summarizing the results individually for each chemical.

The QM database files for surface sediments were imported into Access. Several steps were followed to complete the surface SQG screening process.

1. Import QM database files for surface sediments:
    a. chem.DBF
    b. sample.DBF
    c. station.DBF
    d. study.DBF
    e. qualify.DBF
    f. chemdict.DBF
2. Link QM database files and exclude records associated with:
    a. studies having all stations outside the study area or within an area that was dredged after samples were collected (STUDYID = "23", "42", "71", or "94").
    b. stations with no latitude/longitude values (LATITUDE ≤ 0 and LONGITUDE ≥ 0).
    c. laboratory duplicates (LABREP $\neq$ "1" or "1Y").
3. Reduce surface sediment dataset to records for those chemicals with minimum SQGs.
4. Flag records for data associated with individual stations to be excluded from screening (as identified in Table 3).
5. Identify records with non-detect results (QUALCODE like "U*") and recalculate those results as one-half the detection limit (CONC / 2). (QM stores the detection limit as the concentration for non-detects.)
6. Calculate the hazard quotient for each record as concentration divided by minimum SQG, using one-half the detection limit for non-detects.
7. Flag records for which the hazard quotient based on minimum SQG is greater than 1.

8. Calculate TOC-normalized concentrations for those chemicals with Washington SQS values.

9. Calculate the hazard quotient based on TOC-normalized concentration and Washington SQS value.

10. Flag records for which the TOC-normalized hazard quotient is greater than 1.

11. Calculate the maximum of the two hazard quotients.

12. Flag records with either hazard quotient greater than 1.

13. Export screening results and summarize by chemical using a pivot table in Excel.

The process to normalize chemical concentrations based on TOC in QM was used for this screening. As for screening using the dry-weight concentrations, one-half the detection limit was used for each non-detect result. Note that QM does not use one-half the detection limit when calculating TOC-normalized concentrations for its SQG Pair: One Chemical query.

1. TOCNORM = CONC / (TOC / 100) for samples with TOC $\geq$0.2 percent

2. TOCNORM = CONC / (0.2 / 100) for samples with TOC < 0.2 percent

3. TOCNORM = CONC / (1 / 100) for samples with no reported TOC (TOC = -9.00 in QM)

A detailed summary of the specific tables, queries, and calculations made in Access to complete this screen has been prepared for the project file.

Subsurface Data Screening

QM's subsurface dataset includes concentrations associated with samples collected from below the sediment surface (UDEPTH > 0 cm), as well as surface sediment samples that extend deeper than 30.5 cm (UDEPTH = 0 cm and LDEPTH $\geq$ 30.5 cm). When performing queries in QM for subsurface samples, either all surface data are included (Option "All") or just the surface data collected from samples associated with at-depth cores are included (Option "Core"). To complete the subsurface SQG screening, the surface data needed to be excluded. This was accomplished by using Access and only the subsurface chemistry dataset from the QM database (chemsb.DBF).

The QM database files for subsurface sediments were imported into Access. Similar to the process used for surface SQG screening, several steps were followed to complete the subsurface SQG screening process.

1. Import QM database files for surface sediments:
    a. chemsb.DBF
    b. smpsedsb.DBF

c. station.DBF

d. study.DBF

e. qualify.DBF

f. chemdict.DBF

2. Link QM database files and exclude records associated with:
   a. studies having all stations outside the study area or within an area that was dredged after samples were collected (STUDYID = "42" or "71").
   b. stations with no latitude/longitude values (LATITUDE ≤ 0 and LONGITUDE ≥ 0).
   c. laboratory duplicates (LABREP $\neq$ "1" or "1Y").
3. Reduce surface sediment dataset to records for those chemicals with minimum SQGs.
4. Flag records for data with associated individual stations to be excluded from screening (as identified in Table 4).
5. Identify records with non-detect results (QUALCODE like "U*") and recalculate those results as one-half the detection limit (CONC / 2).
6. Calculate the hazard quotient for each record as concentration divided by minimum SQG, using one-half the detection limit for non-detects.
7. Flag records for which the hazard quotient based on minimum SQG is greater than 1.
8. Calculate TOC-normalized concentrations for those chemicals with Washington SQS values.
9. Calculate the hazard quotient based on TOC-normalized concentration and Washington SQS value.
10. Flag records for which the TOC-normalized hazard quotient is greater than 1.
11. Calculate the maximum of the two hazard quotients.
12. Flag records with either hazard quotient greater than 1.
13. Export screening results and summarize by chemical using a pivot table in Excel.

TOC-normalization was performed using the process described above for surface SQG screening. A detailed summary of the specific tables, queries, and calculations made in Access to complete this screen has been prepared for the project file.

Comparison Against Round 2 Report Benthic COPCs

The results (COPCs identified) of EPA's SQG screen are presented in Table 5 for surface sediments and Table 6 for subsurface sediments. COPCs identified through the SQG screen were compared against all of the benthic COPCs identified in the Round 2 Report (right hand column of Tables 5 & 6). Benthic COPCs for all lines of evidence were considered. For both surface and subsurface sediments, very few chemicals were screened in based on non-detected concentrations only (i.e., the hazard quotient based on the maximum non-detected concentration was greater than 1.0, whereas the hazard quotient based on the maximum detected concentration was less than 1.0). Because the SLERA presented in the Round 2 Report was based on maximum detected concentrations only, none of these chemicals (listed in the first group below) were identified as benthic COPCs.

Benthic COPCs based on ND > SQG

- Aroclor 1016 – surface and subsurface
- Hexachlorocyclopentadiene – surface and subsurface
- 1,3-Dichlorobenzene – surface and subsurface
- Diethyl phthalate – surface only
- Dimethyl phthalate – surface only
- Heptachlor – surface only
- Chlordane (cis & trans) – subsurface only
- 2,4-Dimethylphenol – subsurface only
- 2-Methylphenol – subsurface only
- Phenol – subsurface only
- Tetrachloroethene – subsurface only

Including those mentioned above, for surface sediments, a total of 40 additional benthic COPCs were identified by EPA's SQG screen (i.e., beyond those shown in the Round 2 Report) and for subsurface sediments, a total of 36 additional COPCs were identified. The majority of these additional COPCs were PCBs, pesticides and semi-volatiles, some of which are likely not representative of chemicals "missed" by the Round 2 Report SLERA, but rather are an artifact of the different ways in which the ERA dataset and QM report summed chemicals. For example, the following six COPCs were identified in EPA's SQG screen that were not included as benthic COIs for the Round 2 Report SLERA (only individual and total DDT and PAHs were included there) and, thus, were not subject to the SLERA for the benthic community.

Benthic COPCs for chemical classes (groups) already represented as COPCs

- sum of p,p'-DDD and o,p'-DDD
- sum of p,p'-DDE and o,p'-DDE
- sum of p,p'-DDT and o,p'-DDT
- total benzofluoranthenes
- total high molecular weight PAHs
- total low molecular weight PAHs

The following 14 individual chemicals also were not included as benthic COIs in the Round 2 Report SLERA (Table 3-1, Appendix G2, Round 2 Report) but were identified as COPCs based on EPA's SQG screen.

Benthic COPCs for chemicals not considered to be COIs

- Manganese
- Carbazole
- Individual Aroclors (4)
- Hexachlorocyclopentadiene
- 1,2,4-Trichlorobenzene
- 1,3-Dichlorobenzene
- 2,4-Dimethylphenol
- Benzoic acid
- Butylbenzyl phthalate*
- Di-N-octyl phthalate
- Tetrachloroethene

* Chemicals retained as COPCs for at least one other ecological receptor

The remaining 13 – 17 additional benthic COPCs are chemicals that were identified as benthic COIs, but not identified as benthic COPCs in the Round 2 Report SLERA based on other benthic lines of evidence.

COPCs for chemicals screened but not retained as COPCs for the benthic community

- Chromium* – surface and subsurface
- Mercury* – surface and subsurface
- Selenium* – surface and subsurface
- Silver – surface only
- Aldrin* – subsurface only
- Dieldrin – surface and subsurface
- Heptachlor – subsurface only
- Heptachlor epoxide – surface and subsurface
- Hexachlorobenzene – surface and subsurface
- Gamma-HCH – surface and subsurface
- Hexachlorobutadiene* – surface and subsurface
- N-nitrosodiphenylamine – surface and subsurface
- Pentachlorophenol – surface and subsurface
- Phenol – surface only
- Chlordane (cis and trans) – surface only
- 2-Methylphenol – surface only
- 4-Methylphenol – surface only
- Benzyl alcohol – surface only
- 2,3,7,8-TCDD (Dioxin) – surface and subsurface

* Chemicals retained as COPCs for at least one other ecological receptor

TABLE 5. SURFACE SEDIMENTS MINIMUM SQG SCREENING RESULTS (ACCOUNTING FOR WA SMS SQGS BASED ON TOC NORMALIZATION[1])

QM Class	QM Code	Chemical Name	Units	No. of Values	No. of Detects	Maximum Concentration	Maximum TOC-normalized Concentration	Minimum SQG	Maximum HQ	No. of NDs > SQG	No. of Detects > SQG	Maximum Detected HQ > 1?	Maximum ND HQ > 1?	LWG Round 2 Benthic COPC?
METALS	ANTIMONY	Antimony	PPM	1097	782	32.1	N/A[2]	64	0.50	0	0			Y
	ARSENIC	Arsenic	PPM	1285	1148	83.5	N/A	5.9	14.15	0	164	Y		Y
	CADMIUM	Cadmium	PPM	1231	1146	46.2	N/A	0.596	77.52	0	135	Y		Y
	CHROMIUM	Chromium, total	PPM	1244	1238	774	N/A	37.3	20.75	0	276	Y		
	COPPER	Copper	PPM	1244	1244	1080	N/A	31.6	34.18	0	880	Y		Y
	LEAD	Lead	PPM	1244	1241	1950	N/A	35	55.71	0	233	Y		Y
	MANGANESE	Manganese	PPM	226	226	2130	N/A	1100	1.94	0	1	Y		
	MERCURY	Mercury	PPM	1224	1133	4.84	N/A	0.174	27.82	0	120	Y		
	NICKEL	Nickel	PPM	1240	1223	594	N/A	18	33.00	0	1026	Y		Y
	SELENIUM	Selenium	PPM	1151	569	20	N/A	5	4.00	0	133	Y		
	SILVER	Silver	PPM	1231	1167	14.8	N/A	6.1	2.43	0	2	Y		
	ZINC	Zinc	PPM	1244	1244	2850	N/A	121	23.55	0	438	Y		Y
PAH	METHNAP_2	2-Methylnaphthalene	PPB	1220	953	630000	4144737	38000	109.07	0	42	Y		Y
	ACENAPTHEN	Acenaphthene	PPB	1321	1101	1398820	39966286	16000	2497.89	0	172	Y		Y
	ACENAPTYLE	Acenaphthylene	PPB	1321	1008	285353	8152943	66000	123.53	0	37	Y		Y
	ANTHRACENE	Anthracene	PPB	1321	1163	612422	17497771	57.2	10706.68	3	406	Y	Y	Y
	BAA	Benzo(a)anthracene	PPB	1321	1277	459601	13131457	31.7	14498.45	6	912	Y	Y	Y
	BAP	Benzo(a)pyrene	PPB	1321	1273	621300	17751429	31.9	19476.49	8	965	Y	Y	Y
	BGHIP	Benzo(g,h,i)perylene	PPB	1321	1245	521059	14887400	31000	480.24	2	254	Y	Y	Y
	BKF	Benzo(k)fluoranthene	PPB	1176	1145	100000	N/A	13000	7.69	0	26	Y		Y
	TBFLANTH	Benzofluoranthenes, total	PPB	35	35	717060	20487429	230000	89.08	0	2	Y		
	CARBAZOLE	Carbazole	PPB	1106	633	56000	N/A	1600	35.00	0	22	Y		
	CHRYSENE	Chrysene	PPB	1321	1293	523088	14945371	57.1	9160.91	4	842	Y	Y	Y
	BANTH2	Dibenzo(a,h)anthracene	PPB	1321	1088	52802	1508629	33	1600.06	9	408	Y	Y	Y
	DIBNZFURAN	Dibenzofuran	PPB	1210	919	99303	2837229	15000	189.15	11	58	Y	Y	Y
	FLUORANTHN	Fluoranthene	PPB	1321	1304	1588359	45381686	111.3	14270.97	0	776	Y		Y
	FLUORENE	Fluorene	PPB	1321	1105	661823	18909229	77.4	8550.68	4	266	Y	Y	Y
	ICDP	Indeno(1,2,3-c,d)pyrene	PPB	1321	1244	440201	12577171	34000	369.92	2	231	Y	Y	Y
	NAPTHALENE	Naphthalene	PPB	1326	855	50622980	1446370857	176	287630.57	0	143	Y		Y
	TOTAL_PAH	PAHs, total	PPB	1321	1315	62427747	N/A	1610	38775.00	0	497	Y		Y
	HPAH	PAHs, total high molecular weight PAHs	PPB	1321	1315	5700503	162871514	960000	169.66	0	125	Y		
	LPAH	PAHs, total low molecular weight PAHs	PPB	1321	1275	56727244	1620778400	370000	4380.48	0	110	Y		
	PHENANTHRN	Phenanthrene	PPB	1321	1276	2918707	83391629	41.9	69658.88	2	847	Y	Y	Y
	PYRENE	Pyrene	PPB	1321	1307	1931786	55193886	53	36448.79	0	1012	Y		Y
PEST-PCB	ALDRIN	Aldrin	PPB	899	232	691	N/A	40	17.28	3	3	Y	Y	Y
	AR_1016	Aroclor 1016	PPB	963	1	1000	N/A	530	1.89	4	0		Y	

TABLE 5. SURFACE SEDIMENTS MINIMUM SQG SCREENING RESULTS (ACCOUNTING FOR WA SMS SQGS BASED ON TOC NORMALIZATION[1])

QM Class	QM Code	Chemical Name	Units	No. of Values	No. of Detects	Maximum Concentration	Maximum TOC-normalized Concentration	Minimum SQG	Maximum HQ	No. of NDs > SQG	No. of Detects > SQG	Maximum Detected HQ > 1?	Maximum ND HQ > 1?	LWG Round 2 Benthic COPC?
	AR_1248	Aroclor 1248	PPB	963	271	22300	N/A	1500	14.87	0	1	Y		
	AR_1254	Aroclor 1254	PPB	963	389	2100	N/A	300	7.00	9	25	Y	Y	
	AR_1260	Aroclor 1260	PPB	963	647	5070	N/A	200	25.35	10	33	Y	Y	
	CHLDNE_C_T	Chlordane (cis & trans)	PPB	190	1	43.45	N/A	3.24	13.41	74	1	Y	Y	
	DDD_SUM	DDTs, sum of p,p'-DDD and o,p'-DDD	PPB	931	759	3044	N/A	4.88	623.77	10	310	Y	Y	
	DDE_SUM	DDTs, sum of p,p'-DDE and o,p'-DDE	PPB	930	738	2528	N/A	3.16	800.00	23	292	Y	Y	
	DDT_SUM	DDTs, sum of p,p'-DDT and o,p'-DDT	PPB	916	671	12536	N/A	4.16	3013.46	14	249	Y	Y	
	DDT_TOTAL	DDTs, total of 6 isomers	PPB	932	808	16170.5	N/A	5.28	3062.59	14	537	Y	Y	Y
	DIELDRIN	Dieldrin	PPB	944	189	356	N/A	1.9	187.37	46	28	Y	Y	
	ENDRIN	Endrin	PPB	682	77	100	N/A	2.22	45.05	44	28	Y	Y	Y
	HEPTACHLOR	Heptachlor	PPB	949	55	49.5	N/A	10	4.95	14	0		Y	
	HEPCL_EPOX	Heptachlor epoxide	PPB	948	68	49.5	N/A	0.6	82.50	81	22	Y	Y	
	CLBNZ6	Hexachlorobenzene	PPB	1128	365	1075	64228	380	169.02	326	31	Y	Y	
	CL_CHX_G6	Hexachlorocyclohexane-gamma	PPB	949	169	430	N/A	0.94	457.45	63	107	Y	Y	
	CLCYPEN6	Hexachlorocyclopentadiene	PPB	1106	0	4150	N/A	400	10.38	34	0		Y	
	PP_DDD	p,p'-DDD	PPB	999	820	2780	N/A	3.54	785.31	9	340	Y	Y	Y
	PP_DDE	p,p'-DDE	PPB	996	798	2240	N/A	1.42	1577.46	44	600	Y	Y	Y
	PCB_SUM	PCBs, total (calc)	PPB	966	686	27370	367383	34.1	802.64	26	365	Y	Y	Y
SVOL	CLBNZ124_3	1,2,4-Trichlorobenzene	PPB	1115	14	1075	64228	810	79.29	242	6	Y	Y	
	CLBNZ12_2	1,2-Dichlorobenzene	PPB	1114	18	1075	64228	2300	27.93	116	3	Y	Y	Y
	CLBNZ13_2	1,3-Dichlorobenzene	PPB	1114	4	1075	N/A	300	3.58	7	0		Y	
	CLBNZ14_2	1,4-Dichlorobenzene	PPB	1120	21	1075	82955	3100	26.76	93	4	Y	Y	Y
	MPHN24_2	2,4-Dimethylphenol	PPB	1113	3	1400	N/A	29	48.28	174	2	Y	Y	
	METPHNOL_2	2-Methylphenol	PPB	1163	4	1075	N/A	63	17.06	81	3	Y	Y	
	METPHNOL_4	4-Methylphenol	PPB	1164	536	2500	N/A	670	3.73	7	32	Y	Y	
	BENZOIC_AC	Benzoic acid	PPB	1056	35	26500	N/A	650	40.77	80	5	Y	Y	
	BENZYL_OH	Benzyl alcohol	PPB	1105	58	1075	N/A	57	18.86	96	3	Y	Y	
	B2ETHXPHTH	Bis(2-ethylhexyl)phthalate	PPB	1224	721	440000	22680412	47000	482.56	5	123	Y	Y	Y
	BUTBNZ_PHT	Butylbenzyl phthalate	PPB	1224	357	2800	129630	4900	26.46	48	78	Y	Y	
	DEP	Diethyl phthalate	PPB	1225	19	1075	64228	61000	1.05	1	0		Y	
	DMP	Dimethyl phthalate	PPB	1225	45	1075	64228	53000	1.21	1	0		Y	
	DINBP	Di-n-butyl phthalate	PPB	1223	392	3790	215625	220000	0.98	0	0			Y
	NOCTP2	Di-N-octyl phthalate	PPB	1225	128	30100	792105	58000	13.66	1	13	Y	Y	
	CLBUTAD6	Hexachlorobutadiene	PPB	1136	58	1075	64228	3900	16.47	52	3	Y	Y	
	NNP	N-nitrosodiphenylamine	PPB	1106	8	1075	119231	11000	10.84	15	1	Y	Y	
	CLPHN5	Pentachlorophenol	PPB	1205	185	8410	N/A	360	23.36	9	5	Y	Y	

TABLE 5. SURFACE SEDIMENTS MINIMUM SQG SCREENING RESULTS (ACCOUNTING FOR WA SMS SQGS BASED ON TOC NORMALIZATION[1])

QM Class	QM Code	Chemical Name	Units	No. of Values	No. of Detects	Maximum Concentration	Maximum TOC-normalized Concentration	Minimum SQG	Maximum HQ	No. of NDs > SQG	No. of Detects > SQG	Maximum Detected HQ > 1?	Maximum ND HQ > 1?	LWG Round 2 Benthic COPC?
	PHENOL	Phenol	PPB	1163	337	1075	N/A	420	2.56	7	2	Y	Y	
VOL	CLETHENE4	Tetrachloroethene	PPB	276	2	25	N/A	500	0.05	0	0			
	CLETHENE3	Trichloroethene	PPB	276	6	25	N/A	2100	0.01	0	0			Y
DIOXFURN	PCD2378	2,3,7,8-TCDD (Dioxin)	ng/kg	183	48	111.091	N/A	9	12.34	0	1	Y		

[1] The WA SQS and CSL values were not based on TOC-normalized concentrations for metals, as well as phenol, 2-methylphenol, 4-methylphenol, 2,4,-dimethylphenol, pentachlorophenol, benzyl alcohol, and benzoic acid.

[2] N/A: TOC-normalized concentrations were not calculated. Either TOC-normalization was not applicable (i.e., metals) or no WA CSL/SQS values were available for SQG screening.

Notes:

1) Minimum SQG is based on TEC, TEL, WA CSL, and WA SQS values, without any adjustment for TOC.

2) TOC-normalized concentrations were calculated as TOCNORM = CONC / (TOC / 100), where CONC is 1/2 detection limit for non-detects, with the following two exceptions (as done in QM):

When TOC < 0.2, TOCNORM = CONC / (0.2 / 100).

When TOC = -9 (no value reported), TOCNORM = CONC / (1 / 100).

3) QM surface sediments are defined as those samples with upper depth = 0 cm and lower depth < 30.5 cm.

4) HQs for non-detects were calculated using 1/2 detection limits.

5) QM records included in the screening have LABREP = "1" or "1Y".

TABLE 6. SURFACE SEDIMENTS MINIMUM SQG SCREENING RESULTS (ACCOUNTING FOR WA SMS SQGS BASED ON TOC NORMALIZATION[1])

QM Class	QM Code	Chemical Name	Units	No. of Values	No. of Detects	Maximum Concentration	Maximum TOC-normalized Concentration	Minimum SQG	Maximum HQ	No. of NDs > SQG	No. of Detects > SQG	Maximum Detected HQ > 1?	Maximum ND HQ > 1?	LWG Round 2 Benthic COPC?
METALS	ANTIMONY	Antimony	PPM	902	577	18.2	N/A[2]	64	0.28	0	0			Y
	ARSENIC	Arsenic	PPM	1174	1130	44.5	N/A	5.9	7.54	0	86	Y		Y
	CADMIUM	Cadmium	PPM	1140	1074	7.03	N/A	0.596	11.80	0	116	Y		Y
	CHROMIUM	Chromium, total	PPM	1155	1155	275	N/A	37.3	7.37	0	204	Y		
	COPPER	Copper	PPM	1174	1174	3290	N/A	31.6	104.11	0	673	Y		Y
	LEAD	Lead	PPM	1174	1173	3330	N/A	35	95.14	0	254	Y		Y
	MANGANESE	Manganese	PPM	42	42	872	N/A	1100	0.79	0	0			
	MERCURY	Mercury	PPM	1068	1004	4.14	N/A	0.174	23.79	0	247	Y		
	NICKEL	Nickel	PPM	1171	1171	716	N/A	18	39.78	0	959	Y		Y
	SELENIUM	Selenium	PPM	1000	411	14	N/A	5	2.80	0	38	Y		
	SILVER	Silver	PPM	1137	1073	4.32	N/A	6.1	0.71	0	0			
	ZINC	Zinc	PPM	1174	1174	1930	N/A	121	15.95	0	466	Y		Y
PAH	METHNAP_2	2-Methylnaphthalene	PPB	1125	917	3800000	28195489	38000	741.99	0	85	Y		Y
	ACENAPTHEN	Acenaphthene	PPB	1146	968	3900000	10985915	16000	686.62	0	267	Y		Y
	ACENAPTYLE	Acenaphthylene	PPB	1146	935	1500000	16165414	66000	244.93	0	48	Y		Y
	ANTHRACENE	Anthracene	PPB	1146	982	1300000	11654135	57.2	22727.27	1	436	Y	Y	Y
	BAA	Benzo(a)anthracene	PPB	1146	1036	760000	8500000	31.7	23974.76	1	706	Y	Y	Y
	BAP	Benzo(a)pyrene	PPB	1146	1019	940000	12500000	31.9	29467.08	1	738	Y	Y	Y
	BGHIP	Benzo(g,h,i)perylene	PPB	1146	1025	730000	10000000	31000	322.58	0	254	Y		Y
	BKF	Benzo(k)fluoranthene	PPB	1146	994	540000	N/A	13000	41.54	0	38	Y		Y
	TBFLANTH	Benzofluoranthenes, total	PPB	0				230000		*No subsurface sediment data for TBFLANTH in QM.*				
	CARBAZOLE	Carbazole	PPB	858	481	520000	N/A	1600	325.00	0	44	Y		
	CHRYSENE	Chrysene	PPB	1146	1026	980000	11500000	57.1	17162.87	1	660	Y	Y	Y
	BANTH2	Dibenzo(a,h)anthracene	PPB	1146	905	67000	1100000	33	2030.30	3	353	Y	Y	Y
	DIBNZFURAN	Dibenzofuran	PPB	960	817	230000	7272727	15000	484.85	0	102	Y		Y
	FLUORANTHN	Fluoranthene	PPB	1146	1035	3500000	29699248	111.3	31446.54	1	644	Y	Y	Y
	FLUORENE	Fluorene	PPB	1146	965	1500000	12272727	77.4	19379.84	1	360	Y	Y	Y
	ICDP	Indeno(1,2,3-c,d)pyrene	PPB	1146	1008	610000	9000000	34000	264.71	0	228	Y		Y
	NAPTHALENE	Naphthalene	PPB	1187	824	20000000	142857143	176	113636.36	1	269	Y	Y	Y
	TOTAL_PAH	PAHs, total	PPB	1146	1062	49947000	N/A	1610	31022.98	0	487	Y		Y
	HPAH	PAHs, total high molecular weight PAHs	PPB	1146	1059	10947000	91127820	960000	94.92	0	149	Y		
	LPAH	PAHs, total low molecular weight PAHs	PPB	1146	997	39000000	272932331	370000	737.65	0	172	Y		
	PHENANTHRN	Phenanthrene	PPB	1146	1032	8500000	71428571	41.9	202863.96	0	744	Y		Y
	PYRENE	Pyrene	PPB	1146	1050	4700000	36466165	53	88679.25	1	783	Y	Y	Y
PEST-PCB	ALDRIN	Aldrin	PPB	821	124	1900	N/A	40	47.50	18	13	Y	Y	
	AR_1016	Aroclor 1016	PPB	1061	0	37500	N/A	530	70.75	5	0		Y	

TABLE 6. SURFACE SEDIMENTS MINIMUM SQG SCREENING RESULTS (ACCOUNTING FOR WA SMS SQGS BASED ON TOC NORMALIZATION[1])

QM Class	QM Code	Chemical Name	Units	No. of Values	No. of Detects	Maximum Concentration	Maximum TOC-normalized Concentration	Minimum SQG	Maximum HQ	No. of NDs > SQG	No. of Detects > SQG	Maximum Detected HQ > 1?	Maximum ND HQ > 1?	LWG Round 2 Benthic COPC?
	AR_1248	Aroclor 1248	PPB	1061	322	37500	N/A	1500	25.00	3	2	Y	Y	
	AR_1254	Aroclor 1254	PPB	1061	474	37500	N/A	300	125.00	7	40	Y	Y	
	AR_1260	Aroclor 1260	PPB	1061	591	37500	N/A	200	187.50	7	34	Y	Y	
	CHLDNE_C_T	Chlordane (cis & trans)	PPB	66	0	160	N/A	3.24	49.38	55	0		Y	
	DDD_SUM	DDTs, sum of p,p'-DDD and o,p'-DDD	PPB	939	674	71100	N/A	4.88	14569.67	9	405	Y	Y	
	DDE_SUM	DDTs, sum of p,p'-DDE and o,p'-DDE	PPB	939	634	2829	N/A	3.16	895.25	21	387	Y	Y	
	DDT_SUM	DDTs, sum of p,p'-DDT and o,p'-DDT	PPB	920	608	26290	N/A	4.16	6319.71	9	285	Y	Y	
	DDT_TOTAL	DDTs, total of 6 isomers	PPB	939	742	95382	N/A	5.28	18064.77	4	544	Y	Y	Y
	DIELDRIN	Dieldrin	PPB	860	36	3750	N/A	1.9	1973.68	63	11	Y	Y	
	ENDRIN	Endrin	PPB	570	106	11000	N/A	2.22	4954.95	60	57	Y	Y	Y
	HEPTACHLOR	Heptachlor	PPB	860	37	1900	N/A	10	190.00	26	1	Y	Y	
	HEPCL_EPOX	Heptachlor epoxide	PPB	837	75	1900	N/A	0.6	3166.67	95	50	Y	Y	
	CLBNZ6	Hexachlorobenzene	PPB	915	176	1500	62500	380	164.47	206	38	Y	Y	
	CL_CHX_G6	Hexachlorocyclohexane-gamma	PPB	860	69	1900	N/A	0.94	2021.28	96	57	Y	Y	
	CLCYPEN6	Hexachlorocyclopentadiene	PPB	862	0	19000	N/A	400	47.50	44	0		Y	
	PP_DDD	p,p'-DDD	PPB	1026	772	690000	N/A	3.54	194915.25	7	460	Y	Y	Y
	PP_DDE	p,p'-DDE	PPB	1026	677	24000	N/A	1.42	16901.41	53	540	Y	Y	Y
	PCB_SUM	PCBs, total (calc)	PPB	1061	616	75000	3125000	34.1	2199.41	30	463	Y	Y	Y
SVOL	CLBNZ124_3	1,2,4-Trichlorobenzene	PPB	886	8	1900	14615	810	18.04	104	4	Y	Y	
	CLBNZ12_2	1,2-Dichlorobenzene	PPB	886	24	1650	15000	2300	6.52	30	8	Y	Y	Y
	CLBNZ13_2	1,3-Dichlorobenzene	PPB	886	5	2000	N/A	300	6.67	12	0		Y	
	CLBNZ14_2	1,4-Dichlorobenzene	PPB	936	46	2400	35714	3100	11.52	14	6	Y	Y	Y
	MPHN24_2	2,4-Dimethylphenol	PPB	760	0	25000	N/A	29	862.07	117	0		Y	
	METPHNOL_2	2-Methylphenol	PPB	934	3	4250	N/A	63	67.46	60	0		Y	
	METPHNOL_4	4-Methylphenol	PPB	934	515	3650	N/A	670	5.45	12	1	Y	Y	
	BENZOIC_AC	Benzoic acid	PPB	860	50	120000	N/A	650	184.62	123	13	Y	Y	
	BENZYL_OH	Benzyl alcohol	PPB	890	56	4650	N/A	57	81.58	77	8	Y	Y	
	B2ETHXPHTH	Bis(2-ethylhexyl)phthalate	PPB	1104	405	50000	1463415	47000	31.14	7	46	Y	Y	Y
	BUTBNZ_PHT	Butylbenzyl phthalate	PPB	1100	202	2500	107500	4900	21.94	63	18	Y	Y	
	DEP	Diethyl phthalate	PPB	1100	25	4400	33846	61000	0.55	0	0			
	DMP	Dimethyl phthalate	PPB	1100	19	5100	27622	53000	0.52	0	0			
	DINBP	Di-n-butyl phthalate	PPB	1104	294	3250	67500	220000	0.31	0	0			Y
	NOCTP2	Di-N-octyl phthalate	PPB	1100	28	3180	706667	58000	12.18	0	2	Y		
	CLBUTAD6	Hexachlorobutadiene	PPB	916	62	34000	1416667	3900	363.25	13	3	Y	Y	
	NNP	N-nitrosodiphenylamine	PPB	889	56	2750	24670	11000	2.24	11	3	Y	Y	
	CLPHN5	Pentachlorophenol	PPB	945	264	25000	N/A	360	69.44	9	5	Y	Y	

TABLE 6. SURFACE SEDIMENTS MINIMUM SQG SCREENING RESULTS (ACCOUNTING FOR WA SMS SQGS BASED ON TOC NORMALIZATION[1])

QM Class	QM Code	Chemical Name	Units	No. of Values	No. of Detects	Maximum Concentration	Maximum TOC-normalized Concentration	Minimum SQG	Maximum HQ	No. of NDs > SQG	No. of Detects > SQG	Maximum Detected HQ > 1?	Maximum ND HQ > 1?	LWG Round 2 Benthic COPC?
	PHENOL	Phenol	PPB	935	267	7500	N/A	420	17.86	17	0		Y	
VOL	CLETHENE4	Tetrachloroethene	PPB	461	22	3850	N/A	500	7.70	7	0		Y	
	CLETHENE3	Trichloroethene	PPB	461	108	1900000	N/A	2100	904.76	3	2	Y	Y	Y
DIOXFURN	PCD2378	2,3,7,8-TCDD (Dioxin)	ng/kg	225	55	83.596	N/A	9	9.29	0	4	Y		

[1] The WA SQS and CSL values were not based on TOC-normalized concentrations for metals, as well as phenol, 2-methylphenol, 4-methylphenol, 2,4,-dimethylphenol, pentachlorophenol, benzyl alcohol, and benzoic acid.

[2] N/A: TOC-normalized concentrations were not calculated. Either TOC-normalization was not applicable (i.e., metals) or no WA CSL/SQS values were available for SQG screening.

Notes:

1) Minimum SQG was based on TEC, TEL, WA CSL, and WA SQS values, without any adjustment for TOC.

2) TOC-normalized concentrations were calculated as TOCNORM = CONC / (TOC / 100), where CONC is 1/2 detection limit for non-detects, with the following two exceptions (as done in QM):
When TOC < 0.2, TOCNORM = CONC / (0.2 / 100).
When TOC = -9 (no value reported), TOCNORM = CONC / (1 / 100).

3) QM subsurface sediments are defined as those samples with upper depth ≠ 0 cm and lower depth ≥ 30.5 cm or upper depth > 0 cm.

4) HQs for non-detects were calculated using 1/2 detection limits.

5) QM records included in the screening have LABREP = "1" or "1Y".

Evaluation of Maximum Exposure Concentrations

EPA reviewed the maximum concentrations used for calculating hazard quotients (HQs) in the Round 2 Report's SLERA to confirm that they were accurate. This evaluation was limited to the iCOCs identified in that report; these were selected to represent chemicals that have the potential to be the biggest risk drivers. For each receptor group (e.g., benthic community, fish, wildlife, amphibians and plants), applicable iCOCs were assessed for each line of evidence (e.g., empirical tissue, surface water, transition zone water and dietary). In some cases, data for each iCOC were not available for every component of every line of evidence. These instances are identified below, where applicable.

For sediment, water and tissue concentrations of "single chemicals" such as aldrin, copper and tributyltin (versus "summed chemicals" such as total PAHs, total DDTs and total PCBs), the maximum values presented in the COPC screening tables (Round 2 Report, Appendix G) were compared with those obtained upon querying the ERA Database developed by the LWG and included as appendix A of the Round 2 Report (RiskData_20070216.mdb). Since the ERA database only reported information for single chemicals, maximum sediment and tissue concentrations for summed chemicals were compared with those obtained upon querying the QM database (version 2.6, Portland Harbor Cat1Risk, October 2007 data update)[1]. Because neither QM nor the SCRA database (compiled by Parametrix for the Round 2 Retreat) contained water data, an evaluation of the maximum surface and groundwater concentrations for summed chemicals was not possible.

Benthic Community (Round 2 Report Attachment G2)

The following benthic community iCOCs were identified in the Round 2 Report: cadmium, copper, zinc, benzo(a)pyrene, chrysene, pyrene, total PAHs, total PCBs and total DDTs. Each of these chemicals was evaluated for the empirical tissue line of evidence; however, only cadmium, copper and zinc were assessed for the surface water and transition zone water lines of evidence[2].

EMPIRICAL TISSUE - detailed screen in Tables 3-3 – 3-7 of Round 2 Report, Attachment G2

For each iCOC, tabulated maximum tissue concentrations for single chemicals were screened against maximum tissue concentrations reported in the ERA database. No benzo(a)pyrene, chrysene or pyrene data were reported/available for invertebrates collected with multiplate samplers. No inconsistencies between tabulated and ERA database values were observed.

For each iCOC, tabulated maximum tissue concentrations for summed chemicals were screened against maximum tissue concentrations calculated/reported in QM. No total PAH data were reported/available for invertebrates collected with multiplate samplers. No major inconsistencies

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[1] It was possible to recalculate summed chemical concentrations from the ERA dataset using the summation rules presented in the R2R; however, this would have been considerably more labor-intensive. Note: Only "Cat1Risk" data from QM were used for this evaluation.

[2] Neither QM nor the SCRA database (compiled by Parametrix for the Round 2 Retreat) contained water data; thus, an evaluation of the summed chemical surface and groundwater maximum concentrations was not possible.

between tabulated and QM values were observed. Data were either exactly the same, or were close enough not to change the outcome of the risk evaluation. See the following table (R2R = Round 2 Report).

	FIELD-COLLECTED CLAMS		FIELD-COLLECTED CRAYFISH		INVERTEBRATES COLLECTED WITH MULTIPLATE SAMPLERS		LABORATORY-EXPOSED CLAMS		LABORATORY-EXPOSED WORMS		
	R2R	QM	R2R	QM	R2R	QM	R2R	QM	R2R	QM	TRV
Total PAHs (µg/kg)	4980	3791	731	477	No Data		1320	1228	37300	32789	1000
Total PCBs (µg/kg)	2660	2655	335	280	498	498	189	189	4310	4310	720
Total DDTs (µg/kg)	436	1039	85.4	84.9	94.8	94.8	1040	1039	1490	1486	290

SURFACE WATER - detailed screen in Table 4-2 of Round 2 Report, Attachment G2

For each iCOC, tabulated maximum surface water concentrations for single chemicals were screened against maximum surface water concentrations reported in the ERA database. No inconsistencies between tabulated and ERA database values were observed.

TRANSITION ZONE WATER - detailed screen in Tables 4-4, 4-5 of Round 2 Report, Attachment G2

For each iCOC, tabulated (Table 4-4) maximum transition zone water concentrations for single chemicals were screened against maximum transition zone water concentrations reported in the ERA database. No inconsistencies between tabulated and ERA database values were observed.

Table 4-5 contained organic carbon normalized sediment concentrations, which were not reported in the ERA database. Thus, these data were not evaluated.

Fish (Round 2 Report Attachment G4)

The following fish iCOCs were identified in the Round 2 Report: mercury, tributyltin (TBT), bis(2-ethylhexyl)phthalate (BEHP), total PCBs and total DDTs. Each of these chemicals was evaluated for the empirical tissue and dietary lines of evidence; however, only mercury, TBT and BEHP were examined for the surface water line of evidence[3].

[3] Neither QM nor the SCRA database (compiled by Parametrix for the Round 2 Retreat) contained water data; thus, an evaluation of the summed chemical surface water maximum concentrations was not possible.

EMPIRICAL TISSUE - detailed screen in Tables 2-3 – 2-9 of Round 2 Report, Attachment G2

For each iCOC, tabulated maximum tissue concentrations for single chemicals were screened against maximum tissue concentrations reported in the ERA database. No data were reported/available for any of the fish iCOCs for carp; therefore, the only analyte in Table 2-4 (TCDD) was evaluated. No inconsistencies between tabulated and ERA database values were observed.

For each iCOC, tabulated maximum tissue concentrations for summed chemicals were screened against maximum tissue concentrations calculated/reported in QM. No major inconsistencies between tabulated and QM values were observed. Data were either exactly the same, or were close enough not to change the outcome of the risk evaluation. See the following table.

	Sucker		Sculpin		Peamouth		Chinook		SMB		Pike		
	R2R	QM	R2R	QM	R2R	QM	R2R	QM	R2R	QM	R2R	QM	TRV
Total PCBs (µg/kg)	2060	2020	3400	3360	300	290	277	276	4950	4500	1930	1800	720
Total DDTs (µg/kg)	673	740	3060	3673	225	228	285	284	416	453	764	776	290

DIETARY - detailed screen in Tables 4-6 – 4-12 of Round 2 Report, Attachment G2

For each iCOC, tabulated maximum sediment concentrations[4] for single chemicals were screened against maximum sediment concentrations reported in the ERA database. No BEHP data were reported/available for any fish. No inconsistencies between tabulated and ERA database values for mercury were observed; however, the tabulated maximum TBT concentration was 47,000 µg/kg while the maximum TBT concentration in the ERA database was 46,000 µg/kg. This should not affect COPC determination, since all calculated dietary doses (75.1 – 236 µg/kg) were well above TRV (2.1 µg/kg)[5].

For each iCOC, tabulated maximum sediment concentrations for summed chemicals were screened against maximum sediment concentrations calculated/reported in QM. No major inconsistencies between tabulated and QM values were observed. Data were close enough not to change the outcome of the risk evaluation[6]. See the following table for a summary for all fish.

[4] Only the sediment component of the dietary line of evidence was evaluated, since the prey and diet components are detailed calculations which would have taken considerable effort to recreate.

[5] Doses were not recalculated to support this assertion definitively; however, the largest difference between tabulated and QM values was only 11% (total PCBs), and HQs ranged from 2.4 – 31.5. Therefore, total PCBs would likely still be carried through as a COPC.

[6] See footnote 5.

	R2R	QM	HQ Range
Total PCBs (µg/kg)	30800	27370	2.4 – 31.5
Total DDTs (µg/kg)	16200	16170	2.5 – 4.8

SURFACE WATER - detailed screen in Table 5-2 of Round 2 Report, Attachment G2

For each iCOC, tabulated maximum surface water concentrations for single chemicals were screened against maximum surface water concentrations reported in the ERA database. No mercury data were reported/available. No inconsistencies between tabulated and ERA database values were observed.

Wildlife (Round 2 Report Attachment G6)

The following bird and mammal iCOCs were identified in the Round 2 Report:

- Birds: aldrin, total PCBs/PCB TEQ, dioxin TEQ and total DDTs
- Mammals: total PCBs/PCB TEQ and dioxin TEQ

Aldrin, total PCBs and total DDTs were each evaluated for the dietary line of evidence. However, since QM did not contain calculated/reported values for PCB TEQs in sediments, this iCOC was not evaluated.

DIETARY - detailed screen in Tables 2-11 – 2-16 of Round 2 Report, Attachment G2

For the only single chemical iCOC (aldrin), tabulated maximum sediment concentrations[7] were screened against maximum sediment concentrations reported in the ERA database. No inconsistencies between tabulated and ERA database values were observed.

For each iCOC, tabulated maximum sediment concentrations for summed chemicals were screened against maximum sediment concentrations calculated/reported in QM. QM contained two values for reported dioxin TEQs in sediments (39 and 16 ng/kg). These values were similar to the tabulated values for birds (35,300 pg/g) and mammals (16,600 pg/g); however, they were one order of magnitude different. The relationship between tabulated and QM database values is unclear. Additionally it is uncertain how sediment TEQs are relevant given that TEQs are only toxicologically meaningful when measured in biota tissues. Other than the aforementioned uncertainty regarding dioxin TEQs, no major inconsistencies between tabulated and QM values were observed. Data were close enough not to change the outcome of the risk evaluation[8]. See the following table for a summary for all birds and mammals.

[7] Only the sediment component of the dietary line of evidence was evaluated, since the prey and diet components are detailed calculations which would have taken considerable effort to recreate.

[8] Doses were not recalculated to support this assertion definitively; however, the largest difference between tabulated and QM values was only 11% (total PCBs), and HQs ranged from 3 – 178. Therefore, total PCBs would likely still be carried through as a COPC.

	R2R	QM	HQ Range
Total PCBs (µg/kg)	30800	27370	3 – 178
Total DDTs (µg/kg)	16200	16170	<1 – 12.5

Amphibians (Round 2 Report Attachment G7)

There were no amphibian iCOCs identified in the Round 2 Report. Therefore, the following fish iCOCs were used for the amphibian evaluation: mercury, tributyltin (TBT) and bis(2-ethylhexyl)phthalate (BEHP)[9].

SURFACE WATER - detailed screen in Table 2-2 of Round 2 Report, Attachment G2

For each iCOC, tabulated maximum surface water concentrations for single chemicals were screened against maximum surface water concentrations reported in the ERA database. No mercury data were reported/available. No inconsistencies between tabulated and ERA database values for TBT were observed; however, the tabulated maximum BEHP concentration was 0.025 µg/L and the maximum value in the ERA database was 0.033 µg/L (see the surface water table for fish above). This should not have any effect on the COPC list, since the correct value (0.033) is still well below Chronic Ecological Screening Level (Eco SL; 3 µg/L).

Plants (Round 2 Report Attachment G8)

There were no plant iCOCs identified in the Round 2 Report. Therefore, the following fish iCOCs were used for the plant evaluation: mercury, tributyltin (TBT) and bis(2-ethylhexyl)phthalate (BEHP).

SURFACE WATER - detailed screen in Table 2-2 of Round 2 Report, Attachment G2

For each iCOC, tabulated maximum surface water concentrations for single chemicals were screened against maximum surface water concentrations reported in ERA database. No mercury data were reported/available. No inconsistencies between tabulated and ERA database values for TBT were observed; however, the tabulated maximum BEHP concentration was 0.025 µg/L, and the maximum value in the ERA database was 0.033 µg/L (see the surface water table for fish above). This should not have any effect on the COPC list, since the correct value (0.033) is still well below the Chronic Eco SL (3 µg/L).

[9] Total PCBs and total DDTs were also identified as fish iCOCs; however, since neither QM nor the SCRA database (compiled by Parametrix for the Round 2 Retreat) contained water data, an evaluation of the summed chemical surface water maximum concentrations was not possible.

Evaluation of TRVs

Prior to development and submittal of the Round 2 Report, EPA developed a methodology for selecting screening level toxicity reference values (TRVs) to be used in the preliminary risk evaluation. EPA reviewed the TRVs presented in the Round 2 Report to confirm that the correct TRVs were used in the screening level evaluation. TRVs presented in the Preliminary Risk Evaluation (PRE) and Eco SLs called out specifically by EPA in memorandums to the LWG on March 24, April 28, July 6, and September 15, 2006, provided recommendations for aquatic tissue, aquatic dietary, wildlife dietary, and avian egg TRVs, as well as acute and chronic Eco SLs for water. The TRVs and Eco SLs called out in the EPA memorandums were checked for accuracy against: Tables 4-2, 4-4, and 4-5 of Attachment G2; Tables 2-3 to 2-9, and 5-2 of Attachment G4; Tables 2-11 to 2-16, and 3-2 of Attachment G6; Table 2-2 of Attachment G7; and Table 2-2 of Attachment G8 of the Round 2 Report SLERA.

Results

In general, the screening level evaluation presented in the Round 2 Report followed EPA guidance and used the correct TRVs and Eco SLs in the PRE. The only instances where this was not the case for Eco SLs was: a chronic Eco SL of 0.0001 µg/L, rather than 0.00001 µg/L, for 2,3,7,8-tetrachlordibenzo-*p*-dioxin (TCDD); an acute Eco SL of 32,000 µg/L, rather than 130 µg/L, for ethylbenzene; and a chronic Eco SL of 2,200 µg/L, rather than 220 µg/L, for methylene chloride. The use of incorrect TRVs was limited to: a dietary TRV for birds of 64 µg/kg, rather than 32 µg/kg, for Sum DDE; a dietary TRV for mammals of 2,000 µg/kg, rather than 1,000 µg/kg, for Total PAHs; and a dietary TRV for mammals of 260 µg/kg, rather than 130 µg/kg, for Total DDTs. In instances where EPA guidance regarding TRVs was not followed, the correct TRV or Eco SL was used to calculate the HQs and determine the COPCs presented in the tables in the following section of this report. When TRV or Eco SL substitutions were made that affected the HQs of COPCs presented in these tables, they were footnoted accordingly.

Evaluation of Hazard Quotient Calculation and COPC Determination

In order to evaluate the magnitude by which screening levels were exceeded, hazard quotients (HQs) were calculated for each of the COPCs identified in the Round 2 Report screening-level evaluation (Attachments G2, G4, G6, G7, and G8 of the Round 2 Report). Screening summary tables presented in the Round 2 Report were updated (see below) to show these HQ results. Tables were also generated to show HQs for lines of evidence not summarized (in tables) in the Round 2 Report. In instances where EPA guidance on TRVs or Eco SLs (see previous section) was not followed, the correct TRV or Eco SL was used to calculate the HQ. COIs with HQs greater than 1 were retained as COPCs and presented in summary tables with their respective HQ. However, the maximum concentrations used to calculate the HQs in this task were used as presented in the tables of the Round 2 Report SLERA, and not adjusted based upon the results of the maximum exposure concentrations evaluation task.

Results

The list of COIs identified as COPCs as a result of this task are nearly identical to those presented in the Round 2 Report SLERA. The additional COPCs identified by this exercise can be found in the updated versions of Tables 2-10 (empirical fish tissue) and 3-8 (empirical benthic invertebrate tissue). As noted in their shared footnote in the updated version of Table 2-10, beta-hexachlorocyclohexane (HCH), delta-HCH, butylbenzyl phthalate, and dibutyl phthalate had non-detected concentrations as their maximum values in fish tissue, but their maximum detected concentrations were below their TRVs. None of these COIs were retained as COPCs for this reason, but they were retained as part of this exercise to account for potential detection limit issues that may contribute to a less conservative risk estimate. Hexachlorobutadiene (see updated version of Table 2-10) was not retained as a COPC even though its maximum detected concentration in fish tissue exceeded its TRV, but it was retained here. In benthic invertebrate tissue (see updated version of Table 3-8), beta-HCH was retained as an additional COPC even though its maximum detected concentrations were below its TRV. Like for fish tissue, it was retained as part of this exercise to account for potential detection limit issues that may contribute to a less conservative risk estimate. Finally, as can be seen in the updated version of Table 2-17 (wildlife dietary TRV), HQs for Sum DDE for birds, and Total PAHs and Total DDTs for mammals, doubled after EPA guidance was applied to the TRVs used for HQ calculation. However, these chemicals would still screen in regardless of which HQ was used.

UPDATED VERSION OF TABLE 3-8: SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR BENTHIC INVERTEBRATES

Round 2 COPC	Field-Collected Benthic Invertebrates			Laboratory-Exposed Benthic Invertebrates	
	Clam HQs (Table 3-3)	Crayfish HQs (Table 3-4)	Multiplate Invertebrate[10] HQs (Table 3-5)	Clam HQs (Table 3-6)	Worm HQs (Table 3-7)
Metals					
Arsenic					1.8
Cadmium	2.4				2.8
Copper	4.4	5.7	1.9	1.9	6.5
Zinc	2.0				1.2
Butyltins					
Tributyltin ion	10.6			13.6	34.1
PAHs					
Benzo(a)anthracene					2.6
Benzo(a)pyrene					1.5
Benzo(b)fluoranthene					1.6
Benzo(k)fluoranthene					1.5
Chrysene					3.9
Pyrene					11.0
Total PAHs	5.0			1.3	37.3
Phthalates					
BEHP				22.1	
Dibutyl phthalate	4.8				1.7
PCBs					
Total PCBs	3.7				6.0
Pesticides					
4,4'-DDD	3.0			13.0	19.6
Total DDTs	1.6			3.6	5.1
Beta-HCH	1.7[11]				

BEHP – bis(2-ethylhexyl)phthalate
COPC – chemical of potential concern
HCH – hexachlorocyclohexane
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl

[10] Epibenthic invertebrates and zooplankton.

[11] Maximum value is a non-detected concentration; however, maximum detected concentration did not exceed the screening level toxicity reference value and therefore, COI was not retained as a COPC by LWG.

UPDATED VERSION OF TABLE 3-14: SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) BASED ON THE PREDICTED TISSUE RESIDUE APPROACH

Round 2 COPC	Field-Collected Clam HQs (Table 3-10)	Laboratory-Exposed Clam HQs (Table 3-11)	Laboratory-Exposed Worm HQs (Table 3-12)
Metals			
Antimony			2.9
Arsenic			1.4
Cadmium	11.9		
Copper		1.5	
Zinc	1.5		
Butyltins			
Tributyltin ion	1.7	3.4	6.7
PAHs			
Benzo(a)pyrene			2.5
Pyrene		1.9	2.0
Total PAHs	3.5	6.1	5.3
Pesticides			
Beta-HCH		2.9	1.1
Endrin		3.0	2.5

COPC – chemical of potential concern

HCH – hexachlorocyclohexane

PAH – polycyclic aromatic hydrocarbon

SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR NEAR-BOTTOM SURFACE WATER

Round 2 COPC	Near-Bottom Surface Water HQs (Table 4-2)
Metals	
Zinc (dissolved)	1.2
PAHs	
Benzo(a)anthracene	4.1
Benzo(a)pyrene	10.7
Phenols	
4-Chloro-3-methylphenol	1.1
PCBs	
Total PCBs	1.2
Pesticides	
2,4'-DDD	2.1
2,4'-DDT	18.7
4,4'-DDD	3.3
4,4'-DDT	3.9
Total DDTs	19.9

COPC – chemical of potential concern
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl

SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR TRANSITION ZONE WATER (TZW)

Round 2 COPC	TZW HQs (Table 4-4)
Metals	
Barium (total)	1,097.5
Cadmium (dissolved)	5.8
Copper (dissolved)	1.3
Lead (dissolved)	4.7
Nickel (dissolved)	1.6
Sodium (total)	55.1
Vanadium (total)	19.0
Zinc (dissolved)	14.4
PAHs	
2-Methylnaphthalene	40.0
Acenaphthene	17.4
Anthracene	87.4
Benzo(a)anthracene	1,196.3
Benzo(a)pyrene	2,700.0
Benzo(b)fluoranthene	49.2
Benzo(g,h,i)perylene	65.6
Benzo(k)fluoranthene	14.0
Chrysene	16.9
Dibenzo(a,h)anthracene	13.1
Fluoranthene	17.2
Fluorene	27.7
Indeno(1,2,3-cd)pyrene	61.5
Naphthalene	1,141.7
Phenanthrene	57.5
Pyrene	14.6
SVOCs	
1,2-Dichlorobenzene	45.7
1,4-Dichlorobenzene	16.0
Dibenzofuran	2.2
Pesticides	
2,4'-DDD	1,100.0
2,4'-DDT	93.0
4,4'-DDD	1,300.0
4,4'-DDE	120.0
4,4'-DDT	1,800.0
Total DDTs	3,050.0
Herbicides	
Dalapon	1.2
Silvex™	4.4
VOCs	
1,1-Dichloroethene	1.6
1,2,4-Trimethylbenzene	9.6
1,3,5-Trimethylbenzene	3.0
Benzene	29.6
Carbon disulfide	869.6

Round 2 COPC	TZW HQs (Table 4-4)
Chlorobenzene	240.0
Chloroethane	3.4
cis-1,2-Dichloroethene	113.6
Ethylbenzene	57.0
Isopropylbenzene	2.0
m,p-Xylene	4.4
o-Xylene	11.5
Toluene	18.2
Trichloroethene	4.0
Vinyl chloride	1.1
Total xylenes	33.8
Cyanide	
Cyanide	4,423.1
Perchlorate	
Perchlorate	9,833.3

COPC – chemical of potential concern

PAH – polycyclic aromatic hydrocarbon

SVOC – semivolatile organic compound

VOC – volatile organic compound

SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR EQP-PREDICTED TRANSITION ZONE WATER (TZW)

Round 2 COPC	EqP-Predicted TZW HQs (Table 4-5)
PAHs	
Acenaphthylene	1.3
VOCs	
Acetone	1.3

COPC – chemical of potential concern
EqP – equilibrium partitioning
PAH – polycyclic aromatic hydrocarbon
VOC – volatile organic compound

UPDATED VERSION OF TABLE 2-10: SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR FISH TISSUE

Round 2 COPC	Largescale Sucker HQs (Table 2-3)	Sculpin HQs (Table 2-5)	Peamouth HQs (Table 2-6)	Juvenile Chinook Salmon HQs (Table 2-7)	Smallmouth Bass HQs (Table 2-8)	Northern Pike-minnow HQs (Table 2-9)
Metals						
Chromium	1.0					
Lead			4.8			
Mercury						1.1
Zinc				1.2		
Phthalates						
BEHP	7.7	71.8			223.1	
Butylbenzyl phthalate				3.1[14]		
Dibutyl phthalate				1.9[14]		
SVOCs						
Hexachlorobutadiene		1.3[12]				
PCBs						
Total PCBs	2.9	4.7			6.9	2.7
Pesticides						
4,4'-DDD	2.8	5.7		2.4	2.0	
4,4'-DDT		3.6				
Total DDTs	2.3	10.6			1.4	2.6
Beta-HCH		2.0[13]				
Delta-HCH		2.0[14]				

BEHP – bis(2-ethylhexyl)phthalate
COPC – chemical of potential concern
HCH – hexachlorocyclohexane
PCB – polychlorinated biphenyl
SVOC – semivolatile organic compound

[12] Maximum value is a non-detected concentration, and maximum detected concentration exceeds the screening level toxicity reference value; however, COI was not retained as a COPC by LWG.

[13] Maximum value is a non-detected concentration; however, maximum detected concentration did not exceed the screening level toxicity reference value and therefore, COI was not retained as a COPC by LWG.

SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) BASED ON THE PREDICTED TISSUE RESIDUE APPROACH FOR SCULPIN

Round 2 COPC	Sculpin HQs (Table 3-1)
Metals	
Selenium	8.9
Phthalates	
BEHP	116.6

BEHP – bis(2-ethylhexyl)phthalate
COPC – chemical of potential concern

UPDATED VERSION OF TABLE 4-13: SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR DIETARY DOSE FOR FISH

Round 2 COPC	Largescale Sucker HQs (Table 4-6)	Pre-Breeding Sturgeon HQs (Table 4-7)	Sculpin HQs (Table 4-8)	Peamouth HQs (Table 4-9)	Juvenile Chinook Salmon HQs Table 4-10)	Smallmouth Bass HQs (Table 4-11)	Northern Pikeminnow HQs (Table 4-12)
Metals							
Cadmium	16.9	86.0	15.5	15.5	2.8	7.8	7.8
Copper	5.8	19.3	5.5	5.5	1.4	4.0	4.0
Mercury		1.4					1.6
Butyltins							
Tributyltin ion	45.1	112.4	43.7	43.7	35.8	36.1	36.2
PAHs							
Benzo(a) pyrene		1.9					
Total PAHs		4.4					
PCBs							
Total PCBs	19.6	28.8	19.4	19.4	2.4	18.3	31.5
Pesticides							
Total DDTs	2.5	4.3	4.8	4.8		4.6	4.6

COPC – chemical of potential concern
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl

SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR SURFACE WATER SCREEN FOR FISH

Round 2 COPC	Fish HQs (Table 5-2)
Metals	
Zinc (dissolved)	1.2
PAHs	
Benzo(a)anthracene	4.1
Benzo(a)pyrene	10.7
Phenols	
4-Chloro-3-methylphenol	1.1
PCBs	
Total PCBs	1.3
Pesticides	
2,4'-DDD	2.1
2,4'-DDT	18.7
4,4'-DDD	3.3
4,4'-DDT	3.9
Total DDTs	19.9

COPC – chemical of potential concern
PAH – polycyclic aromatic hydrocarbon
PCB – polychlorinated biphenyl

UPDATED VERSION OF TABLE 2-17: SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR WILDLIFE RECEPTORS

	Wildlife Receptor					
Round 2 COPC	Spotted Sandpiper HQs (Table 2-	Hooded Merganser HQs (Table 2-12)	Bald Eagle HQs (Table 2-13)	Osprey HQs (Table 2-14)	Mink HQs (Table 2-15)	River Otter HQs (Table 2-16)
Metals						
Antimony					2.2	
Arsenic	2.7					
Cadmium	1.2					
Chromium	9.6					
Copper	14.2	2.2			1.2	
Lead	38.3	4.9	1.5	1.3	2.0	
Mercury	17.1	4.2	6.2	10.9	4.9	
Selenium	2.5				2.6	
Thallium	1.8					
Zinc	1.9					
Butyltins						
Butyltin ion	3.0					
Tributyltin ion	2.5					
PAHs						
Benzo(a)pyrene	44.6	3.1		1.4		
Total PAHs	6.8				28.5[15]	4.9[15]
Phthalates						
BEHP	9.9	7.8	7.4	13.0		
Dibutyl phthalate	1.1					
PCBs						
PCB TEQ	73.6	3.9	1.3	1.7	18.8	10.2
Total PCBs	20.7	4.6	3.2	5.5	177.7	101.9
Dioxins and Furans						
Dioxin TEQ	157.0	9.5	3.0	3.1	161.6	31.4
Pesticides						
Aldrin	8.1					
Sum DDD	8.7					
Sum DDE	9.4[14]	7.8[15]	2.3[15]	4.0[15]		
Sum DDT	17.6	25.9	1.4	2.5		
Total DDTs	12.5	6.5			4.3[15]	2.4[15]

BEHP – bis(2-ethylhexyl)phthalate
PCB – polychlorinated biphenyl
COPC – chemical of potential concern
TEQ – toxic equivalent
PAH – polycyclic aromatic hydrocarbon

[14] HQ doubled after EPA guidance (July 6, 2006, memorandum) was applied to TRV used for HQ calculation.

SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR AMPHIBIANS IN SURFACE WATER

Round 2 COPC	Amphibian HQs (Table 2-2)
Metals	
Zinc (dissolved)	1.2
Phenols	
4-Chloro-3-methylphenol	1.1
PCBs	
Total PCBs	1.2
Pesticides	
2,4'-DDT	18.7
4,4'-DDT	1.2
Total DDTs	19.9

COPC – chemical of potential concern
PCB – polychlorinated biphenyl

SUMMARY OF ROUND 2 HAZARD QUOTIENTS (HQS) FOR AQUATIC PLANTS IN SURFACE WATER

Round 2 COPC	Aquatic Plant HQs (Table 2-2)
Metals	
Zinc (dissolved)	1.2
Phenols	
4-Chloro-3-methylphenol	1.1
PCBs	
Total PCBs	1.2
Pesticides	
2,4'-DDT	18.7
4,4'-DDT	1.2
Total DDTs	19.9

COPC – chemical of potential concern

PCB – polychlorinated biphenyl

Summary and Screening-Level COPC List Comparison

The following table is a comparison of all of the COPCs identified in the Round 2 Report and those identified in this screen (shown under "EPA" columns) for each receptor group, except for SQGs where evaluated separately. The lines of evidence responsible for COPC determination are presented and differences between the Round 2 Report and EPA are highlighted. The final COPC lists are very similar with the following exceptions (see chemicals shown with **bold** *italics* and shaded cells in table):

- **Butylbenzyl phthalate** and **delta-HCC** are new COPCs resulting from this screen, based on the fact that these chemicals had maximum non-detected concentrations that exceeded screening criteria. These chemicals were not carried forward as COPCs because the SLERA was based entirely on detected concentrations which, in the case of these chemicals, did not exceed screening criteria. Because for this screen, chemicals were identified as COPCs if either the maximum detected or non-detected concentration exceeded the screening criteria, hexachlorobutadiene, butylbenzyl phthalate and delta-HCC were carried through as COPCs.
- **Hexachlorobutadiene** is a new COPC resulting from this screen. After reviewing HQ calculations, it was discovered that this chemical was erroneously not carried through as a COPC for the empirical fish tissue line of evidence even though its maximum detected concentration exceeded the screening level TRV.
- **Dibutyl phthalate** was identified as an additional COPC based on the empirical fish tissue line of evidence. However, this chemical was already determined to be a COPC based on the empirical benthic tissue line of evidence; thus, this difference between the Round 2 Report and EPA's review did not constitute a change in the final COPC list.
- **beta-HCH** was identified as an additional COPC based on both the empirical fish and benthic tissue lines of evidence. However, this chemical was already determined to be a COPC based on the predicted benthic tissue and fish tissue lines of evidence; thus, this difference between the Round 2 Report and EPA's review did not constitute a change in the final COPC list.

The screening-level evaluation presented here demonstrates that with the exception of not screening sediment chemistry results against SQGs, the screening level evaluation was generally performed in an acceptable manner. EPA requires that the baseline risk assessment for the Portland Harbor site include a Refined screen as a first step. This Refined screen should be conducted based on guidance provided in the appropriate section of EPA's comments on the BERA problem formulation (under separate cover).

COMPILATION AND COMPARISON OF ROUND 2 REPORT AND EPA SLERA COPCS FOR EACH RECEPTOR GROUP

COPC	Benthic Invertebrates		Fish		Wildlife		Amphibians		Aquatic Plants	
	R2R	EPA	R2R	EPA	R2R	EPA	R2R	EPA	R2R	EPA
Metals										
Antimony	2	2			6	6				
Arsenic	1,2	1,2			6	6				
Barium	4	4	4	4					4	4
Cadmium	1,2,4	1,2,4	4,6	4,6	6	6			4	4
Chromium			1	1	6	6				
Copper	1,2,4	1,2,4	4,6	4,6	6	6			4	4
Lead	4	4	1,4	1,4	6	6			4	4
Nickel	4	4	4	4					4	4
Mercury			1,6	1,6	6	6				
Selenium			2	2	6	6				
Sodium	4	4	4	4					4	4
Thallium					6	6				
Vanadium	4	4	4	4					4	4
Zinc	1,2,3,4	1,2,3,4	1,3,4	1,3,4	6	6	3	3	3,4	3,4
Butyltins										
Butyltin ion					6	6				
Tributyltin ion	1,2	1,2	6	6	6	6				
PAHs										
2-Methylnapthalene	4	4	4	4					4	4
Acenaphthene	4	4	4	4					4	4
Acenaphthylene	5	5								
Anthracene	4	4	4	4					4	4
Benzo(a)anthracene	1,3,4	1,3,4	3,4	3,4					4	4
Benzo(a)pyrene	1,2,3,4	1,2,3,4	3,4,6	3,4,6	6	6			4	4
Benzo(b)fluoranthene	1,4	1,4	4	4					4	4
Benzo(g,h,i)perylene	4	4	4	4					4	4
Benzo(k)fluoranthene	1,4	1,4	4	4					4	4
Chrysene	1,4	1,4	4	4					4	4
Dibenzo(a,h)anthracene	4	4	4	4					4	4
Fluoranthene	4	4	4	4					4	4
Fluorene	4	4	4	4					4	4
Indeno(1,2,3-cd)pyrene	4	4	4	4					4	4
Naphthalene	4	4	4	4					4	4
Phenanthrene	4	4	4	4					4	4
Pyrene	1,2,4	1,2,4	4	4					4	4

COMPILATION AND COMPARISON OF ROUND 2 REPORT AND EPA SLERA COPCS FOR EACH RECEPTOR GROUP

COPC	Benthic Invertebrates		Fish		Wildlife		Amphibians		Aquatic Plants	
	R2R	EPA	R2R	EPA	R2R	EPA	R2R	EPA	R2R	EPA
Total PAHs	1,2	1,2	6	6	6	6				
SVOCs										
1,2-Dichlorobenzene	4	4	4	4					4	4
1,4-Dichlorobenzene	4	4	4	4					4	4
Dibenzofuran	4	4	4	4					4	4
Hexachlorobutadiene				1						
VOCs										
1,1-Dichloroethene	4	4	4	4					4	4
1,2,4-Trimethylbenzene	4	4	4	4					4	4
1,3,5-Trimethylbenzene	4	4	4	4					4	4
Acetone	5	5								
Benzene	4	4	4	4					4	4
Carbon disulfide	4	4	4	4					4	4
Chlorobenzene	4	4	4	4					4	4
Chloroethane	4	4	4	4					4	4
cis-1,2-Dichloroethene	4	4	4	4					4	4
Ethylbenzene	4	4	4	4					4	4
Isopropylbenzene	4	4	4	4					4	4
m,p-xylene	4	4	4	4					4	4
o-xylene	4	4	4	4					4	4
Toluene	4	4	4	4					4	4
Trichloroethene	4	4	4	4					4	4
Vinyl chloride	4	4	4	4					4	4
Total xylenes	4	4	4	4					4	4
Phthalates										
BEHP	1	1	1,2	1,2	6	6				
Butylbenzyl phthalate				1						
Dibutyl phthalate	1	1		1	6	6				
PCBs										
PCB TEQ					6	6				
Total PCBs	1,3	1,3	1,3,6	1,3,6	6	6	3	3	3	3
Dioxins										
Dioxin TEQ					6	6				
Pesticides										
Aldrin					6	6				
beta-HCH	2	1,2	1	1						

COMPILATION AND COMPARISON OF ROUND 2 REPORT AND EPA SLERA COPCS FOR EACH RECEPTOR GROUP

COPC	Benthic Invertebrates		Fish		Wildlife		Amphibians		Aquatic Plants	
	R2R	EPA	R2R	EPA	R2R	EPA	R2R	EPA	R2R	EPA
delta-HCC				1						
Endrin	2	2								
2,4'-DDD	3,4	3,4	3,4	3,4					4	4
2,4'-DDT	3,4	3,4	3,4	3,4			3	3	3,4	3,4
4,4'-DDD	1,3,4	1,3,4	1,3,4	1,3,4					4	4
4,4'-DDE	4	4	4	4					4	4
4,4'-DDT	3,4	3,4	1,3,4	1,3,4			3	3	3,4	3,4
Sum DDD					6	6				
Sum DDE					6	6				
Sum DDT					6	6				
Total DDTs	1,3,4	1,3,4	1,3,4,6	1,3,4,6	6	6	3	3	3,4	3,4
Herbicides										
Dalapon	4	4	4	4					4	4
Silvex™	4	4	4	4					4	4
Cyanide										
Cyanide	4	4	4	4					4	4
Perchlorate										
Perchlorate	4	4	4	4					4	4
Phenols										
4-Chloro-3-methylphenol	3	3	3	3			3	3	3	3

New COPCs (based on EPA Review) are identified in ***bold, italics***.

Differences between R2R and EPA Review are in **shaded bold**.

1: Empirical tissue Line of Evidence (LOE)

2: Predicted tissue LOE

3: Surface water LOE

4: Transition zone water LOE

5: EqP-predicted transition zone water LOE

6: Dietary LOE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
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January 16, 2008

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121 NW Everett
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Mr. Robert Wyatt
Northwest Natural & Co-Chairman, Lower Willamette Group
220 Northwest Second Avenue
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Re: Portland Harbor Superfund Site; Administrative Order on Consent for Remedial Investigation and Feasibility Study; Docket No. CERCLA-10-2001-0240.

Dear Messrs. Wyatt and McKenna:

This is in response to your letter dated January 11, 2008 regarding the revised proposal for 2008 calendar year funding for the RI/FS Trust Fund. The budget estimate for the 2008 calendar year totals $3.6 million, which includes an estimated $600,000 for producing the Remedial Investigation and Baseline Risk Assessment Reports.

The Lower Willamette Group (LWG) proposes to deposit an additional $1.6 million into the Trust Fund by February 15, 2008. This amount and the proposed date are based on the anticipated carryover balance of $2 million which the LWG estimates will be adequate to assure that there will be no gap in funding.

EPA hereby approves the 2008 funding proposal of $3.6 million. This letter also confirms our January 14, 2008 approval via email of the proposal to deposit the additional $1.6 million into the Trust Fund by February 15, 2008.

We appreciate your attention to these matters. If you have any questions, please contact Chip Humphrey at (503) 326-2678 or Eric Blischke (503) 326-4006. All legal inquiries should be directed to Lori Cora at (206) 553-1115.

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The technical memorandum summarized the results of the LWG's literature survey and provided a preliminary screening of technologies which would require testing prior to the Feasibility Study (FS) evaluation. It also provided preliminary recommendations on viable technologies to carry forward into the FS evaluation. EPA's comments on the technical memorandum are attached. Eric Stern, EPA Region 2, provided support to EPA Region 10 in the review of this document and preparation of our comments.

We appreciate the LWG's stated desire to work collaboratively on these issues. As noted in our comments, it is critical that sediment treatment options receive a thorough evaluation, including beneficial re-use of treated material. Sediment treatment has also been identified as a key issue by the Portland Harbor Community Advisory Group.

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General Comments

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The initial evaluation of treatment technologies should focus primarily on cost and effectiveness at this point. Siting and permitting challenges should not be used as a screening criteria at this time. Although EPA recognizes that permitting and siting may result in significant challenges, if the technology is effective and cost competitive, it will be in everyone's interest to overcome these permitting and siting challenges.

Overall the Treatability Study Literature Survey presented a comprehensive overview of the "world" of sediment treatment categories and parallel technologies that have undergone bench through commercial scale applications. The literature review covers a wide chronology from the early 1990's to 2006. However, it should be noted that that much of the published work goes back years before the actual publication date. Pilot and full-scale demonstrations of sediment treatment processes (both standard such as dewatering and stabilization/solidification as well as innovative treatment processes) have been progressing over the last 3 years. However some of this recent work has not been reported in literature since it could be part of a private client project, or a larger programmatic federal/state demonstrations currently evolving as more full/commercial scale demonstrations / remediation projects collecting data for regulatory and geotechnical requirements. The Treatability Study Literature Survey should identify, summarize and evaluate the application of treatment technologies at some of these more recent projects.

The Portland Harbor feasibility study (FS) and evaluation of treatment options should consider the concept of net risk reduction. EPA's Contaminated Sediment Remediation Guidance for Hazardous Waste Sites EPA describes "net risk reduction" as a method to ensure that all positive & negative aspects of each sediment management approach are considered at contaminated sediment sites. Net risk reduction considers not only the overall risk reduction offered by different remedial action alternatives, but also risks introduced by implementing the remedy. Treatment of contaminated sediments – whether in conjunction with sediment removal or not – can provide long term risk reduction that should be factored into the analysis of net risk reduction.

EPA recognizes that the standard sediment remediation technologies are generally the most proven and cost effective. These technologies include: 1) Dredging and the subsequent disposal and placement options - nearshore confined disposal facilities (CDFs), confined aquatic disposal (CADs) and upland disposal with or without pretreatment such as stabilization; 2) capping and 3) monitored natural recovery. However, further consideration should be given to hybridization of sediment remediation and treatment options to address multiple contaminants and integration

into long-term regional sediment management (including beneficial use). It should be noted that due to the scale of the Portland Harbor RI/FS, significant quantities of contaminated sediment will require management. These sediments (perhaps in conjunction with dredging projects being contemplated by the U.S. Army Corps of Engineers or at specific facilities) may create some economies of scale for treatment and beneficial re-use of contaminated sediments. The treatment train process which includes up-front materials handling should be a significant factor in decision making of the alternatives. This has proven over and over to be more of an economic factor to a project than the process choice itself.

Specific Comments

Section 2.2: It should be noted that EPA has identified additional iAOPCs beyond those identified in the Round 2 Report.

Although a number of early action sites have been identified, the timing of remedial actions at these sites is currently unclear.

Section 5.1.1 – Passive Dewatering: The Treatability Study Literature Survey identifies the use of geotextile tubes as a passive dewatering device. This technology has been applied recently at the Ashtabula River in Ohio. Information from the implementation of the Ashtabula dredging project managed by the EPA Great Lakes National Program Office should be consulted to better assess the applicability of geotextile tubes at the Portland Harbor site.

Section 5.3.3 – Stabilization/Solidification: The cost of Portland cement for stabilization/solidification is not trivial and is increasing per ton of cement. Current costs for stabilization/solidification with Portland Cement are approximately $100/ton. Stabilization/Solidification processing of NY/NJ harbor sediments is approximately $55-65 cubic yard when used as geotechnical fill for brownfields and sub-base for golf course construction. Clearly, beneficial re-use is one way to reduce unit costs associated with stabilization/solidification.

Section 5.4.3 – Thermal Desorption: The Upcycle lightweight aggregate (LWA) process did not continue its pilot-scale test at the Bayshore Recycling facility in Keasby, NJ. However, there is no reason to believe that lightweight aggregate could not be a viable process with a high value beneficial use product. The concept behind Upcycle though was to utilize existing LWA kilns using a sediment feedstock that would be dewatered and pelletized before *feeding* the kiln.

Section 5.4.4 – Vitrification: It should be noted that the Bayshore Recycling facility is not a regional sediment decontamination facility. The Bayshore Recycling facility was used as an up front materials handling platform utilizing a Great Lakes ore/grain carrier for a sediment hold. The material was pumped out of the ship across a dock into a large warehouse building that housed the BioGenesis sediment washing process. Approximately 14,000 cubic yards of sediment was dredged and processed from the Raritan River, NJ, Arthur Kill federal navigation channel and the Passaic River, NJ Superfund site as part of a dredging pilot (Passaic River) and full-scale sediment decontamination demonstration (2005-2007). BioGenesis dewatered sediment for GTI (Gas Technology Institute) Cement-Lock process utilizing a plate-frame filter

press which was part of their liquid/solid separation process. GTI conducted their demonstration of their thermo-chemical process at the IMTT Facility in Bayonne, NJ using a 10,000 cubic yard/yr demonstration kiln.

The Treatability Study Literature Survey states on page 18 that the "downside to this [vitrification] technology is that the process requires significant electrical energy (or natural gas in the GTI case) and thus costs significantly..." It should be noted that high temperature systems have evolved into waste to energy – gasification, heat recovery – electrical generation designs that over time could be cost effective with manufacturing of a high value beneficial use product (construction grade cement, light weight aggregate etc).

Section 5.5 - Summary: It should be noted that the BioGenesis sediment washing and GTI Cement-Lock process are in the process of submitting draft-final reports from their full-scale demonstration efforts (2006-2007). Both processes are included in the USEPA Passaic River Superfund Focused Feasibility Study (www.ourpassaic.org) as components to hybrid remedial options. Technical memorandums and preliminary results including costs are included in this study. In addition, the USACE ERDC Vicksburg is in the process of developing a report on the "State of the Art of Treatment Technologies" – they are focusing on ex-situ technologies with beneficial use applications. This deliverable will include mass balance and economic projections. Trudy Estes is the principal investigator on this effort.

Section 6.0 - In-Situ treatment: It should be noted that Rutgers University (Ali Maher) and Raito, Inc conducted deep sediment mixing at a site in Newark Bay, NJ under work sponsored by the NJ DOT. A report on this effort is on the NJDOT Office of Maritime Resources website.

Section 7.0 – Evaluation of Treatment Technologies: More successful processes have looked at the treatment train concept of materials handling, technology development, and beneficial use applications. Price structures based on available data today range between $65 – 150 per cubic yards. Treatment technologies should be evaluated not as stand alone options but rather as part of an integrated approach to sediment managment that consideres treatment trains and beneficial re-use. From a programmatic cross-integration perspective, this may include both navigational and Superfund sediments which are critical to accomplish enough flow-through capacity for these technologies to succeed economically on a large scale over the long term. Other programs that may benefit from sediment treatment technologies include brownfield cleanups (soils, sediments, and demolition and construction debris). Integration of technologies as part of a multi-media regional processing facility could provide long-term sustainable infrastructure in conjunction with CDFs to provide active storage capacity to make these facilities renewable and to manufacture beneficial use products.

Section 7.2 - Beneficial use Evaluation: The referenced text states that beneficial use evaluation of treated and untreated sediment options are not part of this literature review and will be considered in the FS on a case-by-case basis. EPA believes that beneficial re-use of treated dredge sediment should be considered in cost estimates for the general evaluation of technologies. Furthermore, it would be helpful to include an initial market survey for potential "beneficial uses" of treated and untreated excavated sediment (e.g., any chance of using sediment in building or road-bed materials in the Portland area, etc.).

Section 7.2.1 – Upland Values for Screening: EPA generally agrees with the strategy of defining upland screening values for dredged sediment, but have several concerns:

- The only screening values the LWG considered were those based on protection of human health. If there is a current or reasonably likely future chance of terrestrial ecological receptors being exposed to the dredge sediment placed in an upland facility, then toxicity eco screening level values would need to be considered. DEQ considers soil to terrestrial eco receptor to be a potentially complete & possibly important exposure pathway (mainly thru ingestion or diet), however, DEQ does not currently have bioaccumulation screening values for this pathway. Placing a strongly bioaccumulative contaminant in an upland facility may require consideration of this pathway.

- The evaluation of treatment technologies should also consider the potential use of in-water or nearshore disposal in a CAD or CDF, or as fill material for Ross Island. Treatment could reduce contaminant levels, bioavailability, leachability etc., sufficient to make these disposal options viable for otherwise unacceptable material. Screening values for dredged sediment for in-water or nearshore disposal should be developed and used in addition to the screening levels for upland disposal.

- The referenced text states the upland values for screening were selected from DEQ's "most restrictive ODEQ residential upland soil cleanup risk-based concentrations" (p.30) that a re based on direct contact with soil. DEQ's Risk-Based Decision Making (RBDM) Guidance considers several human health exposure pathways, & generally, the direct contact with soil pathway lists the most conservative screening value. However, for naphthalene, the most conservative soil screening value is for the leaching to groundwater pathway. This soil leaching to groundwater pathway lists a screening level value of 3.8mg/kg. The LWG used the direct contact screening level of 34mg/kg in their tech memo.

- The document describes additional consideration for PCB-bearing sediments, including DEQ's PCB Generic Remedy guidance. The LWG's tech memo cites upland generic-remedy soil values for PCBs of 1.2mg/kg (residential) & 7.5mg.kg (industrial). The literature review states that DEQ guidance is not directly applicable to the upland disposal of dredge sediment, and that the generic-remedy soil values are presented to simply provide insight. However, the literature review fails to mention that DEQ's PCB Generic Remedy guidance states these generic-remedy soil values apply only where PCBs are the main risk driver, not in a mixture of other risk-driving hazardous substances.

Section 8 – Final Evaluation and Treatability Study Recommendations

As mentioned above in the general comments, *The Probability of Further Evaluation and Consideration for Evaluation in FS* choices for "Very Likely" are fairly obvious within the "world" of alternatives. Optimization of test/project sediment for physical characteristics, chemistry, etc under bench-scale conditions are routine. What was somewhat surprising was the "Very Likely" rating for Asphalt Emulsion. Though it was mentioned that the process has been

proven for soils, (NJDEP Division of Science and Research conducted a pilot in 1998 for soils) it's still from what appears to be under bench-scale development for contaminated sediments with organic and inorganic constituents.

Innovative sediment treatment technologies with beneficial use applications has evolved over the last several years. As more demonstration tests have been completed on pilot and full-scale equipment, more environmental and process data (residual management) has been collected that fulfills regulatory and permitting mandates. Economic data today is also more realistic and critical to commercial-scale process design and especially to venture capitalists who would invest in innovative technologies.

EPA agrees that the technologies likely to move forward into the FS are generally conducted in combination with other technologies or have potential beneficial uses combined with low process costs. As a result, it is critical that the feasibility study consider beneficial use cost off-sets.

The Literature Review states that the technologies being carried forward are generally proven and treatability studies are not warranted to support the FS. EPA does not see the need for treatability studies for those technologies at this time. In the absence of site specific treatability studies, the Portland Harbor FS must assume that these proven treatment technologies will be effective. Further discussion is required to determine how pilot scale evaluations and the assessment of more generic technologies (e.g., solidification/stabilization and capping amendments) will be considered in the FS and remedial design.

The report recommends further investigation of the costs associated with technologies assessed as "unlikely" but with the potential to become economically viable (e.g. ex situ biological and physical/chemical methods). The report notes that the information would be used to determine the likelihood of carrying these technologies forward in a detailed FS evaluation and, if so, treatability testing of the technologies in late 2008 may be warranted. A proposal should be developed to conduct the additional investigation, including other factors to consider in addition to cost, so that treatability testing could be initiated in 2008 if appropriate.

Table 1:

- It is unclear why sorbent clay solidification/stabilization is ranked as very unlikely. It is proven at the bench scale. Demonstrated effectiveness is moderate to high and cost is ranked as moderate.

- It appears premature to eliminate ex-situ chemox. This technology is widely used in the wastewater treatment field and could be implemented as part of a treatment train.

- It is unclear why sediment washing is ranked as very unlikely. It is demonstrated as *limited full scale.*

- Vitrification and Thermal Desorption: It is unclear why these technologies are ranked as unlikely. They have been demonstrated in the New York/New Jersey Harbor area and encourage end use application.

- iAOPCs were grouped according to contaminant and analyzed with respect to potential upland disposal and cleanup levels to determine which sediments would require pre-treatment prior to landfill disposal under a removal GRA scenario. This grouping was based on "risk drivers", ultimately using a single risk driver (ie, PCBs) for an iAOPC. The need for treatment may be driven by other contaminants as well (another constituent may be more mobile or have high toxicity as well). The upcoming leaching tests results will provide additional information that should be considered for some of the areas.

Table 2:

- With the exception of enhanced cap materials, in-situ treatment technologies are all rated as unlikely or highly unlikely. EPA acknowledges that effective in-situ treatment options are currently limited. However, there may be some opportunities at specific locations within Portland Harbor where in-situ treatment technologies could be effective, and they should not be screened out as this stage. The results of ongoing pilot scale work, like the activated carbon pilot projects at the Grasse River (Alcoa), marine sediments in Trondheim Harbor, Norway, and tidal mudflats in San Francisco Bay, should be considered as it becomes available and included as appropriate during the FS. The pilot projects are evaluating different engineering methods of application of activated carbon to PCB-impacted sediments to alter sediment geochemistry and bioavailabilty of PCBs to benthic organisms.

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Innovative sediment treatment technologies with beneficial use applications has evolved over the last several years. As more demonstration tests have been completed on pilot and full-scale equipment, more environmental and process data (residual management) has been collected that fulfills regulatory and permitting mandates. Economic data today is also more realistic and critical to commercial-scale process design and especially to venture capitalists who would invest in innovative technologies.

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The report recommends further investigation of the costs associated with technologies assessed as "unlikely" but with the potential to become economically viable (e.g. ex situ biological and physical/chemical methods). The report notes that the information would be used to determine the likelihood of carrying these technologies forward in a detailed FS evaluation and, if so, treatability testing of the technologies in late 2008 may be warranted. A proposal should be developed to conduct the additional investigation, including other factors to consider in addition to cost, so that treatability testing could be initiated in 2008 if appropriate.

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It should be recognized that the state of sediment treatment is evolving and will continue to evolve until sediment remedies are evaluated and implemented at the Portland Harbor site. In addition, the consideration of sediment treatment has been identified as a key issue by the Portland Harbor Community Advisory Group (CAG). As a result, it is critical that sediment treatment options receive a thorough and rigorous evaluation recognizing that treatment costs can be off-set by beneficial re-use of contaminated sediments post treatment.

The initial evaluation of treatment technologies should focus primarily on cost and effectiveness at this point. Siting and permitting challenges should not be used as a screening criteria at this time. Although EPA recognizes that permitting and siting may result in significant challenges, if the technology is effective and cost competitive, it will be in everyone's interest to overcome these permitting and siting challenges.

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Section 5.5 - Summary: It should be noted that the BioGenesis sediment washing and GTI Cement-Lock process are in the process of submitting draft-final reports from their full-scale demonstration efforts (2006-2007). Both processes are included in the USEPA Passaic River Superfund Focused Feasibility Study (www.ourpassaic.org) as components to hybrid remedial options. Technical memorandums and preliminary results including costs are included in this study. In addition, the USACE ERDC Vicksburg is in the process of developing a report on the "State of the Art of Treatment Technologies" – they are focusing on ex-situ technologies with beneficial use applications. This deliverable will include mass balance and economic projections. Trudy Estes is the principal investigator on this effort.

Section 6.0 - In-Situ treatment: It should be noted that Rutgers University (Ali Maher) and Raito, Inc conducted deep sediment mixing at a site in Newark Bay, NJ under work sponsored by the NJ DOT. A report on this effort is on the NJDOT Office of Maritime Resources website.

Section 7.0 – Evaluation of Treatment Technologies: More successful processes have looked at the treatment train concept of materials handling, technology development, and beneficial use applications. Price structures based on available data today range between $65 – 150 per cubic yards. Treatment technologies should be evaluated not as stand alone options but rather as part of an integrated approach to sediment managment that consideres treatment trains and beneficial re-use. From a programmatic cross-integration perspective, this may include both navigational and Superfund sediments which are critical to accomplish enough flow-through capacity for these technologies to succeed economically on a large scale over the long term. Other programs that may benefit from sediment treatment technologies include brownfield cleanups (soils, sediments, and demolition and construction debris). Integration of technologies as part of a multi-media regional processing facility could provide long-term sustainable infrastructure in conjunction with CDFs to provide active storage capacity to make these facilities renewable and to manufacture beneficial use products.

Section 7.2 - Beneficial use Evaluation: The referenced text states that beneficial use evaluation of treated and untreated sediment options are not part of this literature review and will be considered in the FS on a case-by-case basis. EPA believes that beneficial re-use of treated dredge sediment should be considered in cost estimates for the general evaluation of technologies. Furthermore, it would be helpful to include an initial market survey for potential "beneficial uses" of treated and untreated excavated sediment (e.g., any chance of using sediment in building or road-bed materials in the Portland area, etc.).

Section 7.2.1 – Upland Values for Screening: EPA generally agrees with the strategy of defining upland screening values for dredged sediment, but have several concerns:

- The only screening values the LWG considered were those based on protection of human health. If there is a current or reasonably likely future chance of terrestrial ecological receptors being exposed to the dredge sediment placed in an upland facility, then toxicity eco screening level values would need to be considered. DEQ considers soil to terrestrial eco receptor to be a potentially complete & possibly important exposure pathway (mainly thru ingestion or diet), however, DEQ does not currently have bioaccumulation screening values for this pathway. Placing a strongly bioaccumulative contaminant in an upland facility may require consideration of this pathway.

- The evaluation of treatment technologies should also consider the potential use of in-water or nearshore disposal in a CAD or CDF, or as fill material for Ross Island. Treatment could reduce contaminant levels, bioavailability, leachability etc., sufficient to make these disposal options viable for otherwise unacceptable material. Screening values for dredged sediment for in-water or nearshore disposal should be developed and used in addition to the screening levels for upland disposal.

- The referenced text states the upland values for screening were selected from DEQ's "most restrictive ODEQ residential upland soil cleanup risk-based concentrations" (p.30) that a re based on direct contact with soil. DEQ's Risk-Based Decision Making (RBDM) Guidance considers several human health exposure pathways, & generally, the direct contact with soil pathway lists the most conservative screening value. However, for naphthalene, the most conservative soil screening value is for the leaching to groundwater pathway. This soil leaching to groundwater pathway lists a screening level value of 3.8mg/kg. The LWG used the direct contact screening level of 34mg/kg in their tech memo.

- The document describes additional consideration for PCB-bearing sediments, including DEQ's PCB Generic Remedy guidance. The LWG's tech memo cites upland generic-remedy soil values for PCBs of 1.2mg/kg (residential) & 7.5mg.kg (industrial). The literature review states that DEQ guidance is not directly applicable to the upland disposal of dredge sediment, and that the generic-remedy soil values are presented to simply provide insight. However, the literature review fails to mention that DEQ's PCB Generic Remedy guidance states these generic-remedy soil values apply only where PCBs are the main risk driver, not in a mixture of other risk-driving hazardous substances.

Section 8 – Final Evaluation and Treatability Study Recommendations

As mentioned above in the general comments, *The Probability of Further Evaluation and Consideration for Evaluation in FS* choices for "Very Likely" are fairly obvious within the "world" of alternatives. Optimization of test/project sediment for physical characteristics, chemistry, etc under bench-scale conditions are routine. What was somewhat surprising was the "Very Likely" rating for Asphalt Emulsion. Though it was mentioned that the process has been

proven for soils, (NJDEP Division of Science and Research conducted a pilot in 1998 for soils) it's still from what appears to be under bench-scale development for contaminated sediments with organic and inorganic constituents.

Innovative sediment treatment technologies with beneficial use applications has evolved over the last several years. As more demonstration tests have been completed on pilot and full-scale equipment, more environmental and process data (residual management) has been collected that fulfills regulatory and permitting mandates. Economic data today is also more realistic and critical to commercial-scale process design and especially to venture capitalists who would invest in innovative technologies.

EPA agrees that the technologies likely to move forward into the FS are generally conducted in combination with other technologies or have potential beneficial uses combined with low process costs. As a result, it is critical that the feasibility study consider beneficial use cost off-sets.

The Literature Review states that the technologies being carried forward are generally proven and treatability studies are not warranted to support the FS. EPA does not see the need for treatability studies for those technologies at this time. In the absence of site specific treatability studies, the Portland Harbor FS must assume that these proven treatment technologies will be effective. Further discussion is required to determine how pilot scale evaluations and the assessment of more generic technologies (e.g., solidification/stabilization and capping amendments) will be considered in the FS and remedial design.

The report recommends further investigation of the costs associated with technologies assessed as "unlikely" but with the potential to become economically viable (e.g. ex situ biological and physical/chemical methods). The report notes that the information would be used to determine the likelihood of carrying these technologies forward in a detailed FS evaluation and, if so, treatability testing of the technologies in late 2008 may be warranted. A proposal should be developed to conduct the additional investigation, including other factors to consider in addition to cost, so that treatability testing could be initiated in 2008 if appropriate.

Table 1:

- It is unclear why sorbent clay solidification/stabilization is ranked as very unlikely. It is proven at the bench scale. Demonstrated effectiveness is moderate to high and cost is ranked as moderate.

- It appears premature to eliminate ex-situ chemox. This technology is widely used in the wastewater treatment field and could be implemented as part of a treatment train.

- It is unclear why sediment washing is ranked as very unlikely. It is demonstrated as limited full scale.

- Vitrification and Thermal Desorption: It is unclear why these technologies are ranked as unlikely. They have been demonstrated in the New York/New Jersey Harbor area and encourage end use application.

- iAOPCs were grouped according to contaminant and analyzed with respect to potential upland disposal and cleanup levels to determine which sediments would require pre-treatment prior to landfill disposal under a removal GRA scenario. This grouping was based on "risk drivers", ultimately using a single risk driver (ie, PCBs) for an iAOPC. The need for treatment may be driven by other contaminants as well (another constituent may be more mobile or have high toxicity as well). The upcoming leaching tests results will provide additional information that should be considered for some of the areas.

Table 2:

- With the exception of enhanced cap materials, in-situ treatment technologies are all rated as unlikely or highly unlikely. EPA acknowledges that effective in-situ treatment options are currently limited. However, there may be some opportunities at specific locations within Portland Harbor where in-situ treatment technologies could be effective, and they should not be screened out as this stage. The results of ongoing pilot scale work, like the activated carbon pilot projects at the Grasse River (Alcoa), marine sediments in Trondheim Harbor, Norway, and tidal mudflats in San Francisco Bay, should be considered as it becomes available and included as appropriate during the FS. The pilot projects are evaluating different engineering methods of application of activated carbon to PCB-impacted sediments to alter sediment geochemistry and bioavailabilty of PCBs to benthic organisms.